SIXTH EDITION

HANDBOOK OF CHILD PSYCHOLOGY

VOLUME 1

Theoretical Models of Human Development

Volume Editor

RICHARD M. LERNER

Editors-in-Chief

WILLIAM DAMON

RICHARD M. LERNER

SHOUT
SHARE
IT

HANDBOOK OF CHILD PSYCHOLOGY

HANDBOOK OF CHILD PSYCHOLOGY

SIXTH EDITION

Volume One: Theoretical Models of Human Development

Volume Editor

RICHARD M. LERNER

Editors-in-Chief

WILLIAM DAMON and RICHARD M. LERNER

John Wiley & Sons, Inc.

Copyright © 2006 by John Wiley & Sons, Inc. All rights reserved.

Published by John Wiley & Sons, Inc., Hoboken, New Jersey.
Published simultaneously in Canada.

No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, scanning, or otherwise, except as permitted under Section 107 or 108 of the 1976 United States Copyright Act, without either the prior written permission of the Publisher, or authorization through payment of the appropriate per-copy fee to the Copyright Clearance Center, Inc., 222 Rosewood Drive, Danvers, MA 01923, (978) 750-8400, fax (978) 646-8600, or on the web at www.copyright.com. Requests to the Publisher for permission should be addressed to the Permissions Department, John Wiley & Sons, Inc., 111 River Street, Hoboken, NJ 07030, (201) 748-6011, fax (201) 748-6008.

Limit of Liability/Disclaimer of Warranty: While the publisher and author have used their best efforts in preparing this book, they make no representations or warranties with respect to the accuracy or completeness of the contents of this book and specifically disclaim any implied warranties of merchantability or fitness for a particular purpose. No warranty may be created or extended by sales representatives or written sales materials. The advice and strategies contained herein may not be suitable for your situation. You should consult with a professional where appropriate. Neither the publisher nor author shall be liable for any loss of profit or any other commercial damages, including but not limited to special, incidental, consequential, or other damages.

This publication is designed to provide accurate and authoritative information in regard to the subject matter covered. It is sold with the understanding that the publisher is not engaged in rendering professional services. If legal, accounting, medical, psychological or any other expert assistance is required, the services of a competent professional person should be sought.

Designations used by companies to distinguish their products are often claimed as trademarks. In all instances where John Wiley & Sons, Inc. is aware of a claim, the product names appear in initial capital or all capital letters. Readers, however, should contact the appropriate companies for more complete information regarding trademarks and registration.

For general information on our other products and services please contact our Customer Care Department within the United States at (800) 762-2974, outside the United States at (317) 572-3993 or fax (317) 572-4002.

Wiley also publishes its books in a variety of electronic formats. Some content that appears in print may not be available in electronic books. For more information about Wiley products, visit our web site at www.wiley.com.

Library of Congress Cataloging-in-Publication Data:

Handbook of child psychology / editors-in-chief, William Damon & Richard M. Lerner.—
6th ed.
p. cm.
Includes bibliographical references and indexes.
Contents: v. 1. Theoretical models of human development / volume editor,
Richard M. Lerner — v. 2. Cognition, perception, and language / volume editors,
Deanna Kuhn, Robert Siegler — v. 3. Social, emotional, and personality development /
volume editor, Nancy Eisenberg — v 4. Child psychology in practice / volume editors, K.
Ann Renninger, Irving E. Sigel.
ISBN 0-471-27287-6 (set : cloth)
— ISBN 0-471-27288-4 (v. 1 : cloth) — ISBN 0-471-27289-2 (v. 2 : cloth)
— ISBN 0-471-27290-6 (v. 3 : cloth) — ISBN 0-471-27291-4 (v. 4 : cloth)
1. Child psychology. I. Damon, William, 1944– II. Lerner, Richard M.
BF721.H242 2006
155.4—dc22

2005043951

Printed in the United States of America.
10 9 8 7 6 5 4 3 2 1

In memory of Paul Mussen, whose generosity of spirit
touched our lives and helped build a field.

Contributors

Paul B. Baltes
Max Planck Institute for Human Development
Berlin, Germany

Peter L. Benson
Search Institute
Minneapolis, Minnesota

Thomas R. Bidell
Denver, Colorado

Jochen Brandstädter
Department of Psychology
University of Trier
Trier, Germany

Urie Bronfenbrenner
Department of Human Development
Cornell University
Ithaca, New York

Anton Bucher
University of Salzburg
Salzburg, Austria

Beverley D. Cairns
Social Development Research Center
University of North Carolina
Chapel Hill, North Carolina

Robert B. Cairns
Social Development Research Center
University of North Carolina
Chapel Hill, North Carolina

Mihaly Csikszentmihalyi
Claremont Graduate University
Claremont, California

Glen H. Elder Jr.
Carolina Population Center
The University of North Carolina
Chapel Hill, North Carolina

Kurt W. Fischer
Graduate School of Education
Harvard University
Cambridge, Massachusetts

Jacqueline J. Goodnow
School of Behavioural Science
University of Sydney
Sydney, Australia

Gilbert Gottlieb
Center for Developmental Science
University of North Carolina, Chapel Hill
Chapel Hill, North Carolina

Stephen F. Hamilton
Department of Human Development
Cornell University
Ithaca, New York

Giyoo Hatano
Human Development &
Education Program
University of the Air
Chiba City, Japan

Richard M. Lerner
Department of Child Development
Tufts University
Medford, Massachusetts

Robert A. LeVine
Graduate School of Education
Harvard University
Cambridge, Massachusetts

Robert Lickliter
Department of Psychology
Florida International University
Miami, Florida

Ulman Lindenberger
Max Planck Institute for Human Development
Berlin, Germany

David Magnusson
Department of Psychology
Stockholm University
Stockholm, Sweden

Hazel R. Markus
Department of Psychology
Stanford University
Stanford, California

Peggy J. Miller
Department of Speech Communication
University of Illinois
Champaign, Illinois

Pamela A. Morris
MDCR
New York, New York

Fritz K. Oser
Department of Education
University of Freiburg
Freiburg, Switzerland

Willis F. Overton
Department of Psychology
Temple University
Philadelphia, Pennsylvania

Kevin Rathunde
Department of Family and Consumer Sciences
University of Utah
Salt Lake City, Utah

Peter C. Scales
Search Institute
Minneapolis, Minnesota

W. George Scarlett
Department of Child Development
Tufts University
Medford, Massachusetts

Arturo Sesma Jr.
Search Institute
Minneapolis, Minnesota

Michael J. Shanahan
Department of Sociology
University of North Carolina—Chapel Hill
Chapel Hill, North Carolina

Richard A. Shweder
Committee on Human Development
University of Chicago
Chicago, Illinois

Linda B. Smith
Department of Psychology
Indiana University
Bloomington, Indiana

Margaret Beale Spencer
Department of Psychology
University of Pennsylvania
Philadelphia, Pennsylvania

Håkan Stattin
Department of Social Sciences
Örebro University
Örebro, Sweden

Ursula M. Staudinger
Jacobs Center for Lifelong Learning and
Institutional Development
International University Bremen
Bremen, Germany

Esther Thelen
Department of Psychology
Indiana University
Bloomington, Indiana

Jaan Valsiner
Department of Psychology
Clark University
Worcester, Massachusetts

Douglas Wahlsten
Department of Psychology
University of Windsor
Ontario, Canada

Preface to Handbook of Child Psychology, *Sixth Edition*

WILLIAM DAMON

Scholarly handbooks play several key roles in their disciplines. First and foremost, they reflect recent changes in the field as well as classic works that have survived those changes. In this sense, all handbooks present their editors' and authors' best judgments about what is most important to know in the field at the time of publication. But many handbooks also influence the fields that they report on. Scholars—especially younger ones—look to them for sources of information and inspiration to guide their own work. While taking stock of the shape of its field, a handbook also shapes the stock of ideas that will define the field's future. It serves both as an indicator and as a generator, a pool of received knowledge and a pool for spawning new insight.

THE *HANDBOOK*'S LIVING TRADITION

Within the field of human development, the *Handbook of Child Psychology* has served these key roles to a degree that has been exceptional even among the impressive panoply of the world's many distinguished scholarly handbooks. The *Handbook of Child Psychology* has had a widely heralded tradition as a beacon, organizer, and encyclopedia of developmental study for almost 75 years—a period that covers the vast majority of scientific work in this field.

It is impossible to imagine what the field would look like if it had not occurred to Carl Murchison in 1931 to assemble an eclectic assortment of contributions into the first *Handbook of Child Psychology.* Whether or not Murchison realized this potential (an interesting speculation in itself, given his visionary and ambitious nature), he gave birth to a seminal publishing project that not only has endured over time but has evolved into a thriving tradition across a number of related academic disciplines.

All through its history, the *Handbook* has drawn on, and played a formative role in, the worldwide study of human development. What does the *Handbook*'s history tell us about where we, as developmentalists, have been, what we have learned, and where we are going? What does it tell us about what has changed and what has remained the same in the questions that we ask, in the methods that we use, and in the theoretical ideas that we draw on in our quest to understand human development? By asking these questions, we follow the spirit of the science itself, for developmental questions may be asked about any endeavor, including the enterprise of studying human development. To best understand what this field has to tell us about human development, we must ask how the field itself has developed. In a field that examines continuities and changes, we must ask, for the field itself, what are the continuities and what are the changes?

The history of the *Handbook* is by no means the whole story of why the field is where it is today, but it is a fundamental part of the story. It has defined the choices that have determined the field's direction and has influenced the making of those choices. In this regard, the *Handbook*'s history reveals much about the judgments and other human factors that shape a science.

THE CAST OF CHARACTERS

Carl Murchison was a scholar/impresario who edited *The Psychological Register;* founded and edited key psychological journals; wrote books on social psychology,

politics, and the criminal mind; and compiled an assortment of handbooks, psychology texts, autobiographies of renowned psychologists, and even a book on psychic beliefs (Sir Arthur Conan Doyle and Harry Houdini were among the contributors). Murchison's initial *Handbook of Child Psychology* was published by a small university press (Clark University) in 1931, when the field itself was still in its infancy. Murchison wrote:

> Experimental psychology has had a much older scientific and academic status [than child psychology], but at the present time it is probable that much less money is being spent for pure research in the field of experimental psychology than is being spent in the field of child psychology. In spite of this obvious fact, many experimental psychologists continue to look upon the field of child psychology as a proper field of research for women and for men whose experimental masculinity is not of the maximum. This attitude of patronage is based almost entirely upon a blissful ignorance of what is going on in the tremendously virile field of child behavior. (Murchison, 1931, p. ix)

Murchison's masculine allusion, of course, is from another era; it could furnish some good material for a social history of gender stereotyping. That aside, Murchison was prescient in the task that he undertook and the way that he went about it. At the time Murchison wrote the preface to his *Handbook,* developmental psychology was known only in Europe and in a few forward-looking American labs and universities. Nevertheless, Murchison predicted the field's impending ascent: "The time is not far distant, if it is not already here, when nearly all competent psychologists will recognize that one-half of the whole field of psychology is involved in the problem of how the infant becomes an adult psychologically" (Murchison, 1931, p. x).

For his original 1931 *Handbook,* Murchison looked to Europe and to a handful of American centers (or "field stations") for child research (Iowa, Minnesota, the University of California at Berkeley, Columbia, Stanford, Yale, Clark). Murchison's Europeans included a young "genetic epistemologist" named Jean Piaget, who, in an essay on "Children's Philosophies," quoted extensively from interviews with 60 Genevan children between the ages of 4 and 12 years. Piaget's chapter would provide American readers with an introduction to his seminal research program on children's conceptions of the world. Another European, Charlotte Bühler, wrote a chapter on children's social behavior. In this chapter, which still is fresh today, Bühler described intricate play and communication patterns among toddlers, patterns that developmental psychology would not rediscover until the late 1970s. Bühler also anticipated the critiques of Piaget that would appear during the sociolinguistics heyday of the 1970s:

> Piaget, in his studies on children's talk and reasoning, emphasizes that their talk is much more egocentric than social . . . that children from 3 to 7 years accompany all their manipulations with talk which actually is not so much intercourse as monologue . . . [but] the special relationship of the child to each of the different members of the household is distinctly reflected in the respective conversations. (Buhler, 1931, p. 138)

Other Europeans included Anna Freud, who wrote on "The Psychoanalysis of the Child," and Kurt Lewin, who wrote on "Environmental Forces in Child Behavior and Development."

The Americans whom Murchison chose were equally notable. Arnold Gesell wrote a nativistic account of his twin studies, an enterprise that remains familiar to us today, and Stanford's Louis Terman wrote a comprehensive account of everything known about the "gifted child." Harold Jones described the developmental effects of birth order, Mary Cover Jones wrote about children's emotions, Florence Goodenough wrote about children's drawings, and Dorothea McCarthy wrote about language development. Vernon Jones's chapter on "children's morals" focused on the growth of *character,* a notion that was to become lost to the field during the cognitive-developmental revolution, but that reemerged in the 1990s as the primary concern in the study of moral development.

Murchison's vision of child psychology included an examination of cultural differences as well. His *Handbook* presented to the scholarly world a young anthropologist named Margaret Mead, just back from her tours of Samoa and New Guinea. In this early essay, Mead wrote that her motivation in traveling to the South Seas was to discredit the views that Piaget, Levy-Bruhl, and other nascent "structuralists" had put forth concerning "animism" in young children's thinking. (Interestingly, about a third of Piaget's chapter in the same volume was dedicated to showing how Genevan children took years to outgrow animism.) Mead reported some data that she called "amazing": "In not one of the 32,000 drawings (by young 'primitive' children) was there a single case of personalization of animals, material phenomena, or

inanimate objects" (Mead, 1931, p. 400). Mead parlayed these data into a tough-minded critique of Western psychology's ethnocentrism, making the point that animism and other beliefs are more likely to be culturally induced than intrinsic to early cognitive development. This is hardly an unfamiliar theme in contemporary psychology. Mead also offered a research guide for developmental fieldworkers in strange cultures, complete with methodological and practical advice, such as the following: Translate questions into native linguistic categories; don't do controlled experiments; don't do studies that require knowing ages of subjects, which are usually unknowable; and live next door to the children whom you are studying.

Despite the imposing roster of authors that Murchison assembled for the 1931 *Handbook of Child Psychology,* his achievement did not satisfy him for long. Barely 2 years later, Murchison put out a second edition, of which he wrote: "Within a period of slightly more than 2 years, this first revision bears scarcely any resemblance to the original *Handbook of Child Psychology.* This is due chiefly to the great expansion in the field during the past 3 years and partly to the improved insight of the editor" (Murchison, 1933, p. vii). The tradition that Murchison had brought to life was already evolving.

Murchison saw fit to provide the following warning in his second edition: "There has been no attempt to simplify, condense, or to appeal to the immature mind. This volume is prepared specifically for the scholar, and its form is for his maximum convenience" (Murchison, 1933, p. vii). It is likely that sales of Murchison's first volume did not approach textbook levels; perhaps he received negative comments regarding its accessibility.

Murchison exaggerated when he wrote that his second edition bore little resemblance to the first. Almost half of the chapters were virtually the same, with minor additions and updating. (For the record, though, despite Murchison's continued use of masculine phraseology, 10 of the 24 authors in the second edition were women.) Some of the authors whose original chapters were dropped were asked to write about new topics. So, for example, Goodenough wrote about mental testing rather than about children's drawings, and Gesell wrote a general statement of his maturational theory that went well beyond the twin studies.

But Murchison also made some abrupt changes. He dropped Anna Freud entirely, auguring the marginalization of psychoanalysis within academic psychology. Leonard Carmichael, who was later to play a pivotal role in the *Handbook* tradition, made an appearance as author of a major chapter (by far the longest in the book) on prenatal and perinatal growth. Three other physiologically oriented chapters were added as well: one on neonatal motor behavior, one on visual-manual functions during the first 2 years of life, and one on physiological "appetites" such as hunger, rest, and sex. Combined with the Goodenough and Gesell shifts in focus, these additions gave the 1933 *Handbook* more of a biological thrust, in keeping with Murchison's longstanding desire to display the hard science backbone of the emerging field.

Leonard Carmichael was president of Tufts University when he organized Wiley's first edition of the *Handbook*. The switch from a university press to the long-established commercial firm of John Wiley & Sons was commensurate with Carmichael's well-known ambition; indeed, Carmichael's effort was to become influential beyond anything that Murchison might have anticipated. The book (one volume at that time) was called the *Manual of Child Psychology,* in keeping with Carmichael's intention of producing an "advanced scientific manual to bridge the gap between the excellent and varied elementary textbooks in this field and the scientific periodical literature" (Carmichael, 1946, p. viii).

The publication date was 1946, and Carmichael complained that "this book has been a difficult and expensive one to produce, especially under wartime conditions" (Carmichael, 1946, p. viii). Nevertheless, the project was worth the effort. The *Manual* quickly became the bible of graduate training and scholarly work in the field, available virtually everywhere that human development was studied. Eight years later, now head of the Smithsonian Institution, Carmichael wrote, in the preface to the 1954 second edition, "The favorable reception that the first edition received not only in America but all over the world is indicative of the growing importance of the study of the phenomena of the growth and development of the child" (Carmichael, 1954, p. vii).

Carmichael's second edition had a long life: Not until 1970 did Wiley bring out a third edition. Carmichael was retired by then, but he still had a keen interest in the book. At his insistence, his own name became part of the title of the third edition; it was called, improbably, *Carmichael's Manual of Child Psychology,* even though it had a new editor and an entirely different cast of authors and advisors. Paul Mussen took over as the editor, and once again the project flourished. Now a two-volume set,

the third edition swept across the social sciences, generating widespread interest in developmental psychology and its related disciplines. Rarely had a scholarly compendium become both so dominant in its own field and so familiar in related disciplines. The set became an essential source for graduate students and advanced scholars alike. Publishers referred to *Carmichael's Manual* as the standard against which other scientific handbooks were compared.

The fourth edition, published in 1983, was now redesignated by John Wiley & Sons to become once again the *Handbook of Child Psychology.* By then, Carmichael had passed away. The set of books, now expanded to four volumes, became widely referred to in the field as "the Mussen handbook."

WHAT CARMICHAEL CHOSE FOR THE NOW EMERGENT FIELD

Leonard Carmichael, who became Wiley's editor for the project in its now commercially funded and expanded versions (the 1946 and 1954 *Manuals*), made the following comments about where he looked for his all-important choices of content:

> Both as editor of the *Manual* and as the author of a special chapter, the writer is indebted . . . [for] extensive excerpts and the use of other materials previously published in the *Handbook of Child Psychology, Revised Edition.* (1946, p. viii)

> Both the *Handbook of Child Psychology* and the *Handbook of Child Psychology, Revised Edition,* were edited by Dr. Carl Murchison. I wish to express here my profound appreciation for the pioneer work done by Dr. Murchison in producing these handbooks and other advanced books in psychology. The *Manual* owes much in spirit and content to the foresight and editorial skill of Dr. Murchison. (1954, p. viii)

The first quote comes from Carmichael's preface to the 1946 edition, the second from his preface to the 1954 edition. We shall never know why Carmichael waited until the 1954 edition to add the personal tribute to Carl Murchison. Perhaps a careless typist dropped the laudatory passage from a handwritten version of the 1946 preface and its omission escaped Carmichael's notice. Or perhaps 8 years of further adult development increased Carmichael's generosity of spirit. (It also may be possible that Murchison or his family complained.) In any case, Carmichael acknowledged the roots of his *Manuals,* if not always their original editor. His choice to start with those roots is a revealing part of the *Handbook*'s history, and it established a strong intellectual legacy for our present-day descendants of the early pioneers who wrote for the Murchison and Carmichael editions.

Although Leonard Carmichael took the 1946 *Manual* in much the same direction established by Murchison back in 1931 and 1933, he did bring it several steps further in that direction, added a few twists of his own, and dropped a couple of Murchison's bolder selections. Carmichael first appropriated five Murchison chapters on biological or experimental topics, such as physiological growth, scientific methods, and mental testing. He added three new biologically oriented chapters on animal infancy, physical growth, and motor and behavioral maturation (a tour de force by Myrtal McGraw that instantly made Gesell's chapter in the same volume obsolete). Then he commissioned Wayne Dennis to write an adolescence chapter that focused exclusively on physiological changes associated with puberty.

On the subject of social and cultural influences in development, Carmichael retained five of the Murchison chapters: two chapters on environmental forces on the child by Kurt Lewin and by Harold Jones, Dorothea McCarthy's chapter on children's language, Vernon Jones's chapter on children's morality (now entitled "Character Development—An Objective Approach"), and Margaret Mead's chapter on "primitive" children (now enhanced by several spectacular photos of mothers and children from exotic cultures around the world). Carmichael also stayed with three other Murchison topics (emotional development, gifted children, and sex differences), but he selected new authors to cover them. But Carmichael dropped Piaget and Bühler.

Carmichael's 1954 revision, his second and final edition, was very close in structure and content to the 1946 *Manual.* Carmichael again retained the heart of Murchison's original vision, many of Murchison's original authors and chapter topics, and some of the same material that dated all the way back to the 1931 *Handbook.* Not surprisingly, the chapters that were closest to Carmichael's own interests got the most significant updating. Carmichael leaned toward the biological and physiological whenever possible. He clearly favored experimental treatments of psychological processes. Yet he still kept the social, cultural, and psychological analyses by Lewin, Mead, McCarthy, Terman, Harold Jones, and

Vernon Jones, and he even went so far as to add one new chapter on social development by Harold and Gladys Anderson and one new chapter on emotional development by Arthur Jersild.

The Murchison and Carmichael volumes make for fascinating reading, even today. The perennial themes of the field were there from the start: the nature-nurture debate; the generalizations of universalists opposed by the particularizations of contextualists; the alternating emphases on continuities and discontinuities during ontogenesis; and the standard categories of maturation, learning, locomotor activity, perception, cognition, language, emotion, conduct, morality, and culture—all separated for the sake of analysis, yet, as authors throughout each of the volumes acknowledged, all somehow inextricably joined in the dynamic mix of human development.

These things have not changed. Yet, much in the early editions is now irrevocably dated. Long lists of children's dietary preferences, sleeping patterns, elimination habits, toys, and somatic types look quaint and pointless through today's lenses. The chapters on children's thought and language were written prior to the great contemporary breakthroughs in neurology and brain/behavior research, and they show it. The chapters on social and emotional development were ignorant of the processes of social influence and self-regulation that soon would be revealed through attribution research and other studies in social psychology. Terms such as *cognitive neuroscience, neuronal networks, behavior genetics, social cognition, dynamic systems,* and *positive youth development* were of course unknown. Even Mead's rendition of the "primitive child" stands as a weak straw in comparison to the wealth of cross-cultural knowledge available in today's *cultural psychology.*

Most telling, the assortments of odd facts and normative trends were tied together by very little theory throughout the Carmichael chapters. It was as if, in the exhilaration of discovery at the frontiers of a new field, all the facts looked interesting in and of themselves. That, of course, is what makes so much of the material seem odd and arbitrary. It is hard to know what to make of the lists of facts, where to place them, which ones were worth keeping track of and which ones are expendable. Not surprisingly, the bulk of the data presented in the Carmichael manuals seems not only outdated by today's standards but, worse, irrelevant.

By 1970, the importance of theory for understanding human development had become apparent. Looking back on Carmichael's last *Manual,* Paul Mussen wrote, "The 1954 edition of this *Manual* had only one theoretical chapter, and that was concerned with Lewinian theory which, so far as we can see, has not had a significant lasting impact on developmental psychology" (Mussen, 1970, p. x). The intervening years had seen a turning away from the norm of psychological research once fondly referred to as "dust-bowl empiricism."

The Mussen 1970 edition—or *Carmichael's Manual,* as it was still called—had a new look and an almost entirely new set of contents. The two-volume edition carried only one chapter from the earlier books, Carmichael's updated version of his own long chapter on the "Onset and Early Development of Behavior," which had made its appearance under a different title in Murchison's 1933 edition. Otherwise, as Mussen wrote in his preface, "It should be clear from the outset . . . that the present volumes are not, in any sense, a *revision* of the earlier editions; this is a completely new *Manual*" (Mussen, 1970, p. x).

And it was. In comparison to Carmichael's last edition 16 years earlier, the scope, variety, and theoretical depth of the Mussen volumes were astonishing. The field had blossomed, and the new *Manual* showcased many of the new bouquets that were being produced. The biological perspective was still strong, grounded by chapters on physical growth (by J. M. Tanner) and physiological development (by Dorothy Eichorn) and by Carmichael's revised chapter (now made more elegant by some excerpts from Greek philosophy and modern poetry). But two other cousins of biology also were represented, in an ethological chapter by Eckhard Hess and a behavior genetics chapter by Gerald McClearn. These chapters were to define the major directions of biological research in the field for at least the next 3 decades.

As for theory, Mussen's *Handbook* was thoroughly permeated with it. Much of the theorizing was organized around the approaches that, in 1970, were known as the "three grand systems": (1) Piaget's cognitive-developmentalism, (2) psychoanalysis, and (3) learning theory. Piaget was given the most extensive treatment. He reappeared in the *Manual,* this time authoring a comprehensive (and, some say, definitive) statement of his entire theory, which now bore little resemblance to his 1931/1933 sortings of children's intriguing verbal expressions. In addition, chapters by John Flavell, by David Berlyne, by Martin Hoffman, and by William Kessen, Marshall Haith, and Philip Salapatek all gave major treatments to one or another aspect of Piaget's

body of work. Other approaches were represented as well. Herbert and Ann Pick explicated Gibsonian theory in a chapter on sensation and perception, Jonas Langer wrote a chapter on Werner's organismic theory, David McNeill wrote a Chomskian account of language development, and Robert LeVine wrote an early version of what was soon to become "culture theory."

With its increased emphasis on theory, the 1970 *Manual* explored in depth a matter that had been all but neglected in the book's previous versions: the mechanisms of change that could account for, to use Murchison's old phrase, "the problem of how the infant becomes an adult psychologically." In the process, old questions such as the relative importance of nature versus nurture were revisited, but with far more sophisticated conceptual and methodological tools.

Beyond theory building, the 1970 *Manual* addressed an array of new topics and featured new contributors: peer interaction (Willard Hartup), attachment (Eleanor Maccoby and John Masters), aggression (Seymour Feshback), individual differences (Jerome Kagan and Nathan Kogan), and creativity (Michael Wallach). All of these areas of interest are still very much with us in the new millenium.

If the 1970 *Manual* reflected a blossoming of the field's plantings, the 1983 *Handbook* reflected a field whose ground cover had spread beyond any boundaries that could have been previously anticipated. New growth had sprouted in literally dozens of separate locations. A French garden, with its overarching designs and tidy compartments, had turned into an English garden, a bit unruly but glorious in its profusion. Mussen's two-volume *Carmichael's Manual* had now become the four-volume Mussen *Handbook,* with a page-count increase that came close to tripling the 1970 edition.

The grand old theories were breaking down. Piaget was still represented by his 1970 piece, but his influence was on the wane throughout the other chapters. Learning theory and psychoanalysis were scarcely mentioned. Yet the early theorizing had left its mark, in vestiges that were apparent in new approaches, and in the evident conceptual sophistication with which authors treated their material. No return to dust bowl empiricism could be found anywhere in the set. Instead, a variety of classical and innovative ideas were coexisting: Ethology, neurobiology, information processing, attribution theory, cultural approaches, communications theory, behavioral genetics, sensory-perception models, psycholinguistics, sociolinguistics, discontinuous stage theories, and continuous memory theories all took their places, with none quite on center stage. Research topics now ranged from children's play to brain lateralization, from children's family life to the influences of school, day care, and disadvantageous risk factors. There also was coverage of the burgeoning attempts to use developmental theory as a basis for clinical and educational interventions. The interventions usually were described at the end of chapters that had discussed the research relevant to the particular intervention efforts, rather than in whole chapters dedicated specifically to issues of practice.

This brings us to the efforts under the present editorial team: the *Handbook*'s fifth and sixth editions (but really the seventh and eighth editions, if the germinal two pre-Wiley Murchison editions are counted). I must leave it to future commentators to provide a critical summation of what we have done. The volume editors have offered introductory and/or concluding renditions of their own volumes. I will add to their efforts here only by stating the overall intent of our design and by commenting on some directions that our field has taken in the years from 1931 to 2006.

We approached our editions with the same purpose that Murchison, Carmichael, and Mussen before us had shared: "to provide," as Mussen wrote, "a comprehensive and accurate picture of the current state of knowledge—the major systematic thinking and research—in the most important research areas of the psychology of human development" (Mussen, 1983, p. vii). We assumed that the *Handbook* should be aimed "specifically for the scholar," as Murchison declared, and that it should have the character of an "advanced text," as Carmichael defined it. We expected, though, that our audiences may be more interdisciplinary than the readerships of previous editions, given the greater tendency of today's scholars to cross back and forth among fields such as psychology, cognitive science, neurobiology, history, linguistics, sociology, anthropology, education, and psychiatry. We also believed that research-oriented practitioners should be included under the rubric of the "scholars" for whom this *Handbook* was intended. To that end, for the first time in 1998 and again in the present edition, we devoted an entire volume to child psychology in practice.

Beyond these very general intentions, we have let chapters in the *Handbook*'s fifth and sixth editions take their own shape. We solicited the chapters from authors who were widely acknowledged to be among the leading experts in their areas of the field, although we know that, given an entirely open-ended selection process and

no limits of budget, we would have invited a large number of other leading researchers whom we did not have the space—and thus the privilege—to include. With very few exceptions, every author whom we invited agreed to accept the challenge. Our only real, and great, sadness was to hear of the passing of several authors from the 1998 edition prior to our assembly of the present edition. Where possible, we arranged to have their collaborators revise and update their chapters.

Our directive to authors was simple: Convey your area of the field as you see it. From then on, the authors took center stage—with, of course, much constructive feedback from reviewers and volume editors. No one tried to impose a perspective, a preferred method of inquiry, or domain boundaries on any of the chapters. The authors expressed their views on what researchers in their areas attempt to accomplish, why they do so, how they go about it, what intellectual sources they draw on, what progress they have made, and what conclusions they have reached.

The result, in my opinion, is still more glorious profusion of the English garden genre, but perhaps contained a bit by some broad patterns that have emerged over the past decade. Powerful theoretical models and approaches—not quite unified theories, such as the three grand systems—have begun once again to organize much of the field's research and practice. There is great variety in these models and approaches, and each is drawing together significant clusters of work. Some have been only recently formulated, and some are combinations or modifications of classic theories that still have staying power.

Among the formidable models and approaches that the reader will find in this *Handbook* are the dynamic system theories, the life span and life course approaches, cognitive science and neuronal models, the behavior genetics approach, person-context interaction theories, action theories, cultural psychology, and a wide assortment of neo-Piagetian and neo-Vygotskian models. Although some of these models and approaches have been in the making for some time, they have now come into their own. Researchers are drawing on them directly, taking their implied assumptions and hypotheses seriously, using them with specificity and control, and exploiting their implications for practice.

Another pattern that emerges is a rediscovery and exploration of core processes in human development that had been underexamined by the generation of researchers just prior to the present one. Scientific interest has a way of moving in alternating cycles (or spirals, for those who wish to capture the progressive nature of scientific development). In our time, developmental study has cycled away from classic topics such as motivation and learning—not in the sense that they were entirely forgotten, or that good work ceased to be done in such areas, but in the sense that they no longer were the most prominent subjects of theoretical reflection and debate. Some of the relative neglect was intentional, as scholars got caught up in controversies about whether psychological motivation was a "real" phenomenon worthy of study or whether learning could or should be distinguished from development in the first place. All this has changed. As the contents of our current edition attest, developmental science always returns, sooner or later, to concepts that are necessary for explaining the heart of its concerns, progressive change in individuals and social groups over time, and concepts such as learning and motivation are indispensable for this task. Among the exciting features of this *Handbook* edition are the advances it presents in theoretical and empirical work on these classic concepts.

The other concept that has met some resistance in recent years is the notion of development itself. For some social critics, the idea of progress, implicit in the notion of development, has seemed out of step with principles such as equality and cultural diversity. Some genuine benefits have accrued from that critique; for example, the field has worked to better appreciate diverse developmental pathways. But, like many critique positions, it led to excesses. For some, it became questionable to explore issues that lie at the heart of human development. Growth, advancement, positive change, achievement, and standards for improved performance and conduct, all were questioned as legitimate subjects of investigation.

Just as in the cases of learning and motivation, no doubt it was inevitable that the field's center of gravity sooner or later would return to broad concerns of development. The story of growth from infancy to adulthood is a developmental story of multifaceted learning, acquisitions of skills and knowledge, waxing powers of attention and memory, growing neuronal and other biological capacities, formations and transformations of character and personality, increases and reorganizations in the understanding of self and others, advances in emotional and behavioral regulation, progress in communicating and collaborating with others, and a host of other achievements documented in this edition. Parents, teachers, and

other adults in all parts of the world recognize and value such developmental achievements in children, although they do not always know how to understand them, let alone how to foster them.

The sorts of scientific findings that the *Handbook*'s authors explicate in their chapters are needed to provide such understanding. The importance of sound scientific understanding has become especially clear in recent years, when news media broadcast story after story based on simplistic and biased popular speculations about the causes of human development. The careful and responsible discourse found in these chapters contrasts sharply with the typical news story about the role of parents, genes, or schools in children's growth and behavior. There is not much contest as to which source the public looks to for its information and stimulation. But the good news is that scientific truth usually works its way into the public mind over the long run. The way this works would make a good subject for developmental study some day, especially if such a study could find a way to speed up the process. In the meantime, readers of this edition of the *Handbook of Child Psychology* will find the most solid, insightful and current set of scientific theories and findings available in the field today.

February 2006
Palo Alto, California

REFERENCES

Bühler, C. (1931). The social participation of infants and toddlers. In C. Murchison (Ed.), *A handbook of child psychology.* Worcester, MA: Clark University Press.

Carmichael, L. (Ed.). (1946). *Manual of child psychology.* New York: Wiley.

Carmichael, L. (Ed.). (1954). *Manual of child psychology* (2nd ed.). New York: Wiley.

Mead, M. (1931). The primitive child. In C. Murchison (Ed.), *A handbook of child psychology.* Worcester, MA: Clark University Press.

Murchison, C. (Ed.). (1931). *A handbook of child psychology.* Worcester, MA: Clark University Press.

Murchison, C. (Ed.). (1933). *A handbook of child psychology* (2nd ed.). Worcester, MA: Clark University Press.

Mussen, P. (Ed.). (1970). *Carmichael's manual of child psychology.* New York: Wiley.

Mussen, P. (Ed.). (1983). *Handbook of child psychology.* New York: Wiley.

Acknowledgments

A work as significant as the *Handbook of Child Psychology* is always produced by the contributions of numerous people, individuals whose names do not necessarily appear on the covers or spines of the volumes. Most important, we are grateful to the more than 150 colleagues whose scholarship gave life to the Sixth Edition. Their enormous knowledge, expertise, and hard work make this edition of the *Handbook* the most important reference work in developmental science.

In addition to the authors of the chapters of the four volumes of this edition, we were fortunate to have been able to work with two incredibly skilled and dedicated editors within the Institute for Applied Research in Youth Development at Tufts University, Jennifer Davison and Katherine Connery. Their "can-do" spirit and their impressive ability to attend to every detail of every volume were invaluable resources enabling this project to be completed in a timely and high quality manner.

It may be obvious, but we want to stress also that without the talent, commitment to quality, and professionalism of our editors at John Wiley & Sons, this edition of the *Handbook* would not be a reality and would not be the cutting-edge work we believe it to be. The breadth of the contributions of the Wiley staff to the *Handbook* is truly enormous. Although we thank all these colleagues for their wonderful contributions, we wish to make special note of four people in particular: Patricia Rossi, Senior Editor, Psychology, Linda Witzling, Senior Production Editor, Isabel Pratt, Associate Editor, and Peggy Alexander, Vice President and Publisher. Their creativity, professionalism, sense of balance and perspective, and unflagging commitment to the tradition of quality of the *Handbook* were vital ingredients for any success we may have with this edition. We are also deeply grateful to Pam Blackmon and her colleagues at Publications Development Company for undertaking the enormous task of copy editing and producing the thousands of pages of the Sixth Edition. Their professionalism and commitment to excellence were invaluable resources and provided a foundation upon which the editors' work was able to move forward productively.

Child development typically happens in families. So too, the work of editors on the *Handbook* moved along productively because of the support and forbearance of spouses, partners, and children. We thank all of our loved ones for being there for us throughout the several years on which we have worked on the Sixth Edition.

Numerous colleagues critiqued the chapters in manuscript form and provided valuable insights and suggestions that enhanced the quality of the final products. We thank all of these scholars for their enormous contributions.

William Damon and Richard M. Lerner thank the John Templeton Foundation for its support of their respective scholarly endeavors. In addition, Richard M. Lerner thanks the National 4-H Council for its support of his work. Nancy Eisenberg thanks the National Institute of Mental Health, the Fetzer Institute, and The Institute for Research on Unlimited Love—Altruism, Compassion, Service (located at the School of Medicine, Case Western Reserve University) for their support. K. Ann Renninger and Irving E. Sigel thank Vanessa Ann Gorman for her editorial support for Volume 4. Support from the Swarthmore College Provost's Office to K. Ann Renninger for editorial assistance on this project is also gratefully acknowledged.

Finally, in an earlier form, with Barbara Rogoff's encouragement, sections of the preface were published in *Human Development* (April 1997). We thank Barbara for her editorial help in arranging this publication.

Contents

1 **DEVELOPMENTAL SCIENCE, DEVELOPMENTAL SYSTEMS, AND CONTEMPORARY THEORIES OF HUMAN DEVELOPMENT** 1
Richard M. Lerner

2 **DEVELOPMENTAL PSYCHOLOGY: PHILOSOPHY, CONCEPTS, METHODOLOGY** 18
Willis F. Overton

3 **THE MAKING OF DEVELOPMENTAL PSYCHOLOGY** 89
Robert B. Cairns and Beverley D. Cairns

4 **DEVELOPMENTAL EPISTEMOLOGY AND IMPLICATIONS FOR METHODOLOGY** 166
Jaan Valsiner

5 **THE SIGNIFICANCE OF BIOLOGY FOR HUMAN DEVELOPMENT: A DEVELOPMENTAL PSYCHOBIOLOGICAL SYSTEMS VIEW** 210
Gilbert Gottlieb, Douglas Wahlsten, and Robert Lickliter

6 **DYNAMIC SYSTEMS THEORIES** 258
Esther Thelen and Linda B. Smith

7 **DYNAMIC DEVELOPMENT OF ACTION AND THOUGHT** 313
Kurt W. Fischer and Thomas R. Bidell

8 **THE PERSON IN CONTEXT: A HOLISTIC-INTERACTIONISTIC APPROACH** 400
David Magnusson and Håkan Stattin

9 **THE DEVELOPING PERSON: AN EXPERIENTIAL PERSPECTIVE** 465
Kevin Rathunde and Mihaly Csikszentmihalyi

10 **ACTION PERSPECTIVES ON HUMAN DEVELOPMENT** 516
Jochen Brandtstädter

11 | **LIFE SPAN THEORY IN DEVELOPMENTAL PSYCHOLOGY** 569
Paul B. Baltes, Ulman Lindenberger, and Ursula M. Staudinger

12 | **THE LIFE COURSE AND HUMAN DEVELOPMENT** 665
Glen H. Elder Jr. and Michael J. Shanahan

13 | **THE CULTURAL PSYCHOLOGY OF DEVELOPMENT: ONE MIND, MANY MENTALITIES** 716
Richard A. Shweder, Jacqueline J. Goodnow, Giyoo Hatano, Robert A. LeVine, Hazel R. Markus, and Peggy J. Miller

14 | **THE BIOECOLOGICAL MODEL OF HUMAN DEVELOPMENT** 793
Urie Bronfenbrenner and Pamela A. Morris

15 | **PHENOMENOLOGY AND ECOLOGICAL SYSTEMS THEORY: DEVELOPMENT OF DIVERSE GROUPS** 829
Margaret Beale Spencer

16 | **POSITIVE YOUTH DEVELOPMENT: THEORY, RESEARCH, AND APPLICATIONS** 894
Peter L. Benson, Peter C. Scales, Stephen F. Hamilton, and Arturo Sesma Jr.

17 | **RELIGIOUS AND SPIRITUAL DEVELOPMENT THROUGHOUT THE LIFE SPAN** 942
Fritz K. Oser, W. George Scarlett, and Anton Bucher

Author Index 999

Subject Index 1037

CHAPTER 1

Developmental Science, Developmental Systems, and Contemporary Theories of Human Development

RICHARD M. LERNER

FROM DEVELOPMENTAL PSYCHOLOGY TO DEVELOPMENTAL SCIENCE 2
IMPLICATIONS OF RELATIONAL METATHEORIES FOR DEVELOPMENTAL SCIENCE 5
FROM DEFICIT TO DIVERSITY IN DEVELOPMENTAL SCIENCE 6
VESTIGES OF REDUCTIONIST MODELS 7
USING THE DEVELOPMENTAL SYSTEMS PERSPECTIVE FOR THEORY, RESEARCH, AND APPLICATION 10
DIVERSITY—A FUNDAMENTAL ASSET OF HUMAN DEVELOPMENT 11
FEATURES AND IMPLICATIONS OF A POSITIVE HUMAN DEVELOPMENT PERSPECTIVE 11
FRAMING THE RESEARCH AGENDA OF HUMAN DEVELOPMENT 12
CONCLUSIONS 13
REFERENCES 14

Much like the universities within which they are typically formulated, theoretical innovations in human development usually move at glacial speed. As described by Cairns and Cairns (Chapter 3, this *Handbook,* this volume), decades may elapse between the formulation of a new approach to human development and its ascendancy and proliferation in variations of the initial model as it is used in research and organized into a network, or "family" (Reese & Overton, 1970) of related theories. Finally, it passes from the scene, losing its role as an active or influential frame for research and application. This diminution of influence can occur for many reasons.

There may be the identification of (a) fundamental conceptual flaws, including empirically counterfactual assertions (e.g., see Overton, Chapter 2, this *Handbook,* this volume, for examples of theories that split nature-variables from nurture-variables in attempting to account for human development, and also Lerner, 2004a, 2004b, for a discussion of these problems in behavior genetic and sociobiological instances of such split conceptions); (b) irreparable problems with the methods associated with the empirical tests of ideas derived from the theory (e.g., see Gottlieb, Walhsten, & Lickliter, Chapter 5, this *Handbook,* this volume, Garcia Coll, Bearer, & Lerner, 2004, and Lerner, 2002, for discussions of such problems in behavior genetics and sociobiology); or (c) substantive "overreaching," that is, attempting to account for phenomena beyond the scope of the model (e.g., see Collins, Maccoby, Steinberg, Hetherington, & Bornstein, 2000; Elder & Shanahan, Chapter 12, this *Handbook,* this volume; Horowitz, 2000; Shweder et al., Chapter 13, this *Handbook,* this volume; Suomi, 2004a, 2004b, for discussions of this problem in genetic reductionist accounts, as occur in behavior genetics and sociobiology, of social behavior or of the social and cultural institutions of society; see Fischer & Bidell, Chapter 7, this *Handbook,* this volume, and Thelen & Smith, Chapter 6, this *Handbook,* this volume, for discussions of this problem in neonativist accounts of cognitive development; and see Bloom, 1998, for a discussion of this problem in behaviorist accounts of language development).

The preparation of this chapter was supported in part by grants from the National 4-H Council and from the John Templeton Foundation.

Cairns and Cairns (Chapter 3, this *Handbook,* this volume) note as well that a theoretical innovation in one period may actually constitute a return to ideas from an earlier era. When theoretical ideas are initially introduced, they may not become popular or even accepted for several reasons. There may be a lack of conceptual preparedness for the ideas or vocabulary used in a theory (e.g., see Flavell, 1963, for a discussion of why Piaget's early formulations, e.g., in 1923, were not embraced in the United States for almost 40 years). In addition, the ideas in a theory may not be able to be tested optimally because of methodological limitations (e.g., the absence of statistical procedures for modeling multilevel, hierarchically embedded, and reciprocal relations across time; e.g., see Nesselroade & Ram, 2004). Moreover, the "spirit of the times," the *zeitgeist* (Boring, 1950), may preclude acceptance of ideas that would require realigning the sociology of the science. Cairns and Cairns (Chapter 3, this *Handbook,* this volume) recount the challenges of instituting a truly multidisciplinary field of child development given the more than 50-year predominance of psychologists and of psychogenic (and reductionist) theories in that field.

Nevertheless, such conceptual, methodological, and sociological constraints on the acceptance of a theoretical orientation may be overcome (e.g., through the sort of evidentiary process involved in the paradigmatic revolutions discussed by Kuhn, 1962). As such, a theory introduced in one historical period may be rediscovered or a newer instantiation of it may be generated, albeit being "old wine in a new bottle."

The focus within the contemporary study of human development on concepts and models associated with developmental systems theories (Cairns & Cairns, Chapter 3, this *Handbook,* this volume; Gottlieb et al., Chapter 5, this *Handbook,* this volume; Lerner, 2002; Overton, Chapter 2, this *Handbook,* this volume) is a case in point, especially given that the roots of these models may be linked to ideas in developmental science that were presented at least as early as the 1930s and 1940s (e.g., Maier & Schneirla, 1935; Novikoff, 1945a, 1945b; von Bertalanffy, 1933), if not even significantly earlier. Table 1.1 presents the defining features of developmental systems theories and, as Cairns and Cairns (Chapter 3, this *Handbook,* this volume) illustrate, there are parallels between the ideas presented in this table and the interests of and concepts used by late nineteenth-century and early twentieth-century founders of the study of child development.

Among the interrelated, and in fact "fused" (Tobach & Greenberg, 1984), defining features of contemporary developmental systems theories of human development are (a) relationism, the integration of levels of organization; (b) historical embeddedness and temporality; (c) relative plasticity; and (d) diversity (Damon & Lerner, 1998; Lerner, 2004a, 2004b). As discussed in the Cairns and Cairns chapter, these four components of developmental systems theories of human development have a long and rich tradition in the history of the field (Cairns & Cairns, Chapter 3, this *Handbook,* this volume). For example, Cairns and Cairns describe James Mark Baldwin's (1897/1906) interest in the study of development-in-context, and thus in integrated, multilevel, and hence interdisciplinary scholarship. These interests were shared as well by Lightner Witmer, the founder in 1896 of the first psychological clinic in the United States (Cairns & Cairns, Chapter 3, this *Handbook,* this volume; Lerner, 1977).

Cairns and Cairns also describe the conception of developmental processes within developmental systems theories—involving reciprocal interaction, bidirectionality, plasticity, and biobehavioral organization (all modern emphases)—as integral in the thinking of the founders of the field of human development. Wilhelm Stern (1914) stressed the holism that is associated with a developmental systems perspective about these developmental processes. Other contributors to the foundations and early progress ofthe field of human development (e.g., John Dewey, 1916; Kurt Lewin, 1935, 1954; and John B. Watson, 1928) stressed the importance of linking child development research with application and child advocacy (Bronfenbrenner, 1974; Zigler, 1998). This orientation toward the application of developmental science is a contemporary view as well, derived from the stress on plasticity and temporal embeddedness within developmental systems theories.

FROM DEVELOPMENTAL PSYCHOLOGY TO DEVELOPMENTAL SCIENCE

In the almost decade that has passed between placing the fifth edition of the *Handbook of Child Psychology* into production and the appearance of the sixth edition, there has been a remarkably rapid change in the predominant theoretical foci used to study human development. Nevertheless, it is possible to interpret the contemporary

TABLE 1.1 Defining Features of Developmental Systems Theories

A Relational Metatheory
Predicated on a postmodern philosophical perspective that transcends Cartesian dualism, developmental systems theories are framed by a relational metatheory for human development. There is, then, a rejection of all splits between components of the ecology of human development (e.g., between nature- and nurture-based variables), and between continuity and discontinuity and between stability and instability. Systemic syntheses or integrations replace dichotomizations or other reductionist partitions of the developmental system.

The Integration of Levels of Organization
Relational thinking and the rejection of Cartesian splits is associated with the idea that all levels of organization within the ecology of human development are integrated, or fused. These levels range from the biological and physiological through the cultural and historical.

Developmental Regulation across Ontogeny Involves Mutually Influential Individual ← → Context Relations
As a consequence of the integration of levels, the regulation of development occurs through mutually influential connections among all levels of the developmental system, ranging from genes and cell physiology through individual mental and behavioral functioning to society, culture, the designed and natural ecology and, ultimately, history. These mutually influential relations may be represented generically as Level 1 ← →, Level 2 (e.g., Family ← → Community), and in the case of ontogeny may be represented as individual ← → context.

Integrated Actions, Individual ← → Context Relations, Are the Basic Unit of Analysis within Human Development
The character of developmental regulation means that the integration of actions—of the individual on the context and of the multiple levels of the context on the individual (individual ← → context)—constitute the fundamental unit of analysis in the study of the basic process of human development.

Temporality and Plasticity in Human Development
As a consequence of the fusion of the historical level of analysis—and therefore temporality—in the levels of organization comprising the ecology of human development, the developmental system is characterized by the potential for systematic change, by plasticity. Observed trajectories of intraindividual change may vary across time and place as a consequence of such plasticity.

Relative Plasticity
Developmental regulation may both facilitate and constrain opportunities for change. Thus, change in individual ← → context relations is not limitless, and the magnitude of plasticity (the probability of change in a developmental trajectory occurring in relation to variation in contextual conditions) may vary across the life span and history. Nevertheless, the potential for plasticity at both individual and contextual levels constitutes a fundamental strength of all human development.

Intraindividual Change, Interindividual Differences in Intraindividual Change, and the Fundamental Substantive Significance of Diversity
The combinations of variables across the integrated levels of organization within the developmental system that provide the basis of the developmental process will vary at least in part across individuals and groups. This diversity is systematic and lawfully produced by idiographic, group differential, and generic (nomothetic) phenomena. The range of interindividual differences in intraindividual change observed at any point in time is evidence of the plasticity of the developmental system, and makes the study of diversity of fundamental substantive significance for the description, explanation, and optimization of human development.

Optimism, the Application of Developmental Science, and the Promotion of Positive Human Development
The potential for and instantiations of plasticity legitimate an optimistic and proactive search for characteristics of individuals and of their ecologies that, together, can be arrayed to promote positive human development across life. Through the application of developmental science in planned attempts (interventions) to enhance (e.g., through social policies or community-based programs) the character of humans' developmental trajectories, the promotion of positive human development may be achieved by aligning the strengths (operationized as the potentials for positive change) of individuals and contexts.

Multidisciplinarity and the Need for Change-Sensitive Methodologies
The integrated levels of organization comprising the developmental system require collaborative analyses by scholars from multiple disciplines. Multidisciplinary knowledge and, ideally, interdisciplinary knowledge is sought. The temporal embeddedness and resulting plasticity of the developmental system requires that research designs, methods of observation and measurement, and procedures for data analysis be change-sensitive and able to integrate trajectories of change at multiple levels of analysis.

emphases on developmental systems theories, not as a new lens for the study of human development, but as a return to the historical roots of the field (e.g., in taking an integrative approach to nature and nurture, in stressing multidisciplinarity, in considering the role of spirituality as a vital dimension of human life, and in applying developmental science). What Cairns (1998) and I (Lerner, 1998) observed in our respective chapters in the fifth edition of the handbook as theoretical trends or cutting-edge interests in developmental science have become, at this writing, clear indicators of the mainstream and distinctive features of the field. Indeed, the

centrality of systemic and multidisciplinary thinking, spanning and integrating basic and applied scholarship, has been associated with a change in the very label of the field during this time period.

A decade ago, most scholars studying human development labeled the field either as *developmental psychology* or, if they were not themselves psychologists (e.g., Elder, 1998), as a field wherein psychological science was the predominant lens through which to study the span of human life. Today, however, the field has become much more deeply and broadly multidisciplinary (and, in some subareas, actually interdisciplinary or, in other words, disciplinarily integrative, e.g., see Elder & Shanahan, Chapter 12, this *Handbook,* this volume; Gottlieb et al., Chapter 5, this *Handbook,* this volume; Shweder et al., Chapter 13, this *Handbook,* this volume). As a consequence, more and more scholars of human development refer to their field as developmental science (e.g., see Cairns & Cairns, Chapter 3, this *Handbook,* this volume; Magnusson & Stattin, Chapter 8, this *Handbook,* this volume), and at least one leading graduate textbook in the field has changed its title from *Developmental Psychology* (Bornstein & Lamb, 1999) to *Developmental Science* (Bornstein & Lamb, 2005).

The change of name for the field studying the human life span reflects in large part key intellectual changes across the past decade: (a) the certain demise of split conceptions of the nature-nurture issue, and of reductionistic approaches to either nature formulations (sociobiology or behavior genetics) or to nurture formulations (e.g., S-R [stimulus-response] models or functional analysis approaches) (Overton, Chapter 2, this *Handbook,* this volume; Valsiner, Chapter 4, this *Handbook,* this volume); (b) the ascendancy of focus on developmental systems models, conceptions that seek to fuse systemically the levels of organization involved in the ecology of human development (from biology and physiology through culture and history; e.g., see Baltes, Lindenberger, & Staudinger, Chapter 11, this *Handbook,* this volume; Elder & Shanahan, Chapter 12, this *Handbook,* this volume; Gottlieb et al., Chapter 5, this *Handbook,* this volume; Thelen & Smith, Chapter 6, this *Handbook,* this volume); and (c) the emphasis on relations among levels and not on the main effects of any level itself, as constituting the fundamental units of analysis of developmental analysis (e.g., see Bronfenbrenner & Morris, Chapter 14, this *Handbook,* this volume; Brandtstädter, Chapter 10, this *Handbook,* this volume; Fischer & Bidell, Chapter 7, this *Handbook,* this volume; Magnusson & Stattin, Chapter 8, this *Handbook,* this volume; Rathunde & Csikszentmihalyi, Chapter 9, this *Handbook,* this volume).

The range of chapters in this edition of the *Handbook* illustrates the diverse theoretical family of models that are instances of or, at the least, are framed by developmental systems ideas about the relational processes linking the multiple, integrated levels of organization within the ecology of human development. These models conceptualize both traditional areas of interest within the study of human development, such as biological development (Gottlieb et al., Chapter 5, this *Handbook,* this volume); perceptual and motor development (Thelen & Smith, Chapter 6, this *Handbook,* this volume); personality, affective, and social development (Brandtstädter, Chapter 10, this *Handbook,* this volume; Bronfenbrenner & Morris, Chapter 14, this *Handbook,* this volume; Elder & Shanahan, Chapter 12, this *Handbook,* this volume; Magnusson & Stattin, Chapter 8, this *Handbook,* this volume; Rathunde & Csikszentmihalyi, Chapter 9, this *Handbook,* this volume); culture and development (Shweder et al., Chapter 13, this *Handbook,* this volume); and cognitive development (Baltes et al., Chapter 11, this *Handbook,* this volume; Fischer & Bidell, Chapter 7, this *Handbook,* this volume), and emergent areas of intellectual interest such as spiritual and religious development (Oser, Scarlett, & Bucher, Chapter 17, this *Handbook,* this volume); the development of diverse children (Spencer, Chapter 15, this *Handbook,* this volume); and positive human development (Benson, Scales, Hamilton, & Sesma, Chapter 16, this *Handbook,* this volume).

Indeed, the potential plasticity of human development that is a defining feature of ontogenetic change within the dynamic, developmental system (Baltes et al., Chapter 11, this *Handbook,* this volume; Gottlieb et al., Chapter 5, this *Handbook,* this volume; Thelen & Smith, Chapter 6, this *Handbook,* this volume) provides a rationale for both the application of developmental science (Cairns & Cairns, Chapter 3, this *Handbook,* this volume) and for the possibility that positive development may be promoted across the life course of humans through the identification and alignment of resources in individuals and their contexts that foster health and positive growth (Benson et al., Chapter 16, this *Handbook,* this volume). Moreover, the emphasis on how the individual acts on the context to

contribute to the plastic relations with the context that regulate adaptive development (Brandtstädter, Chapter 10, this *Handbook,* this volume) fosters an interest in person-centered (compared with variable-centered) approaches to the study of human development (Magnusson & Stattin, Chapter 8, this *Handbook,* this volume; Overton, Chapter 2, this *Handbook,* this volume; Rathunde & Csikszentmihalyi, Chapter 9, this *Handbook,* this volume). Furthermore, given that the array of individual and contextual variables involved in these relations constitute a virtually open set (e.g., there are over 70 trillion potential human genotypes and each of them may be coupled across life with an even larger number of life course trajectories of social experiences; Hirsch, 2004), the diversity of development becomes a prime, substantive focus for developmental science (Lerner, 2004a; Spencer, Chapter 15, this *Handbook,* this volume). The diverse person, conceptualized from a strength-based perspective (in that the potential plasticity of ontogenetic change constitutes a fundamental strength of all humans; Spencer, Chapter 15, this *Handbook,* this volume), and approached with the expectation that positive changes can be promoted across all instances of this diversity as a consequence of health-supportive alignments between people and setting (Benson et al., Chapter 16, this *Handbook,* this volume), becomes the necessary subject of developmental science inquiry.

These theoretical emphases in developmental science have been coupled with enormous advances in quantitative statistical approaches, arguably especially in the longitudinal methods required to appraise the changing relations in the developmental system between the individual and the context (e.g., see Duncan, Magnuson, & Ludwig, 2004; Laub & Sampson, 2004; McArdle & Nesselroade, 2003; Molenaar, 2004; Nesselroade & Ram, 2004; Phelps, Furstenberg, & Colby, 2002; Singer & Willett, 2003; Skrondal & Rabe-Hesketh, 2004; von Eye, 1990; von Eye & Bergman, 2003; von Eye & Gutiérrez Peña, 2004; Willett, 2004; Young, Savola, & Phelps, 1991). Moreover, there has been an increased appreciation of the importance of qualitative methods, both as valuable tools for the analysis of the life course and as a means to triangulating quantitative appraisals of human development. As such, there has been a growth in the use of traditional qualitative methods, along with the invention of new qualitative techniques (e.g., Mishler, 2004).

Finally, this exciting and innovative period in developmental theory and methodology has been framed by a renewed appreciation of the philosophical grounding of developmental science in postmodern ideas. The philosophical ideas that have had the most attraction to developmental scientists are relational conceptions that transcend fruitless debates (e.g., regarding maturation versus early experience as the basis for learning, or neonativist versus empiricist bases of early cognitive development; e.g., see Spelke & Newport, 1998) predicated on false dichotomies that split apart the fused developmental system (e.g., see Overton, 1998, 2003, Chapter 2, this *Handbook,* this volume; Valsiner, 1998, Chapter 4, this *Handbook,* this volume).

IMPLICATIONS OF RELATIONAL METATHEORIES FOR DEVELOPMENTAL SCIENCE

The ascendancy of a developmental systems frame for the conduct of developmental science has been a product and a producer of a shift in the paradigm, or philosophy of science, framing discourse within the field (Overton, 1998, 2003, Chapter 2, this *Handbook,* this volume). As noted, the field has changed from being predicated on a positivist and reductionist metatheory, wherein a key assumption was that the universe was uniform and that it was permanent. It has shifted to a postmodernist conception that transcends Cartesian splits between the real and the epiphenomenal (e.g., as instantiated within past eras as nature versus nurture, maturation versus learning, continuity versus discontinuity, stability versus instability, or simply constancy versus change; Brim & Kagan, 1980; Lerner, 2002; Overton, Chapter 2, this *Handbook,* this volume). The integrative, relational metatheory that has emerged by avoiding all splits (Overton, 1998, Chapter 2, this *Handbook,* this volume) focuses instead on the construction of relations across the range of levels of organization constituting the ecology of human development (e.g., Baltes, 1997; Baltes et al., Chapter 11, this *Handbook,* this volume; Bronfenbrenner, 2005; Bronfenbrenner & Morris, Chapter 14, this *Handbook,* this volume; Elder & Shanahan, Chapter 12, this *Handbook,* this volume; Thelen & Smith, Chapter 6, this *Handbook,* this volume).

Moreover, within the context of the relational metatheory that has served as a product and a producer of developmental systems thinking (Lerner, 2002), there has been a rejection of an idea that is derived from the positivist and reductionist notion that the universe is uniform and permanent—that the study of human behavior should be aimed at identifying nomothetic laws that pertain to the generic human being. This idea was replaced by a stress on the individual, on the importance of attempting to identify both differential and potentially idiographic laws as involved in the course of human life (e.g., Block, 1971; Magnusson, 1999a, 1999b), and on regarding the individual as an active producer of his or her own development (Brandtstädter, 1998, 1999, Chapter 10, this *Handbook,* this volume; Lerner, 1982; Lerner & Busch-Rossnagel, 1981; Lerner, Theokas, & Jelicic, 2005; Rathunde & Csikszentmihalyi, Chapter 9, this *Handbook,* this volume). Similarly, the changed philosophical grounding of the field has altered developmental science from a field that enacted research as if time and place were irrelevant to the existence and operation of laws of behavioral development to a field that has sought to identify the role of contextual embeddedness and temporality in shaping the developmental trajectories of diverse individuals and groups (e.g., see Baltes et al., Chapter 11, this *Handbook,* this volume; Bronfenbrenner & Morris, Chapter 14, this *Handbook,* this volume; Elder, Modell, & Parke, 1993; Elder & Shanahan, Chapter 12, this *Handbook,* this volume).

Arguably, the most profound impact of the relational metatheory on the practice of developmental science has occurred in the conceptualization of diversity, of interindividual differences, in developmental trajectories (Lerner, 2004a, 2004b; Spencer, Chapter 15, this *Handbook,* this volume). From the perspective of the uniformity and permanence assumptions, individual differences—diversity—were seen, at best, through a lens of error variance, as prima facie proof of a lack of experimental control or of inadequate measurement. At worst, diversity across time or place, or in the individual differences among people, was regarded as an indication that a deficit was present. Either the person doing the research was remiss for using a research design or measurement model that was replete with error (with a lack of experimental control sufficient to eliminate interindividual differences), *or* the people who varied from the norms associated with the generic human being—the relations among variables that were generalizable across time and place—were in some way deficient (cf. Gould, 1981, 1996). They were, to at least some observers, less than normatively human.

FROM DEFICIT TO DIVERSITY IN DEVELOPMENTAL SCIENCE

For colleagues trained in developmental science within the past decade, the prior philosophical grounding and associated philosophical assumptions about science may seem either unbelievably naive or simply quaint vestiges from an unenlightened past. In what, for the history of science, is a very short period (Cairns & Cairns, Chapter 3, this *Handbook,* this volume), participants in the field of human development have seen a sea change that perhaps qualifies as a true paradigm shift in what is thought of as the nature of human nature and in the appreciation of time, place, and individual diversity for understanding the laws of human behavior and development (Bronfenbrenner & Morris, Chapter 14, this *Handbook,* this volume; Elder & Shanahan, Chapter 12, this *Handbook,* this volume; Overton, Chapter 2, this *Handbook,* this volume; Shweder et al., Chapter 13, this *Handbook,* this volume; Valsiner, Chapter 4, this *Handbook,* this volume).

The publication in 1998 of the fifth edition of the *Handbook of Child Psychology,* edited by William Damon, heralded that the field of human development rejected the hegemony of positivism and reductionism. As evidenced by the chapters in all four volumes of the Damon (1998) *Handbook,* and arguably especially in the volume of that edition that corresponds to the present one, *Theoretical Models of Human Development* (Damon & Lerner, 1998), the majority of the scholarship then defining the cutting edge of the field of human development was associated with the sorts of developmental systems models of human development that fill the pages of the present edition of this volume of the *Handbook* and that, as projected by Cairns and Cairns in 1998, were at the threshold of their time of ascendancy within developmental science.

The view of the world that emerged from the chapters in the fifth edition of Volume 1 of the *Handbook* (Damon & Lerner, 1998) and that is confirmed across the chapters of the present volume (including those chapters represented in both editions and those chapters new to this edition) is that the universe is dynamic and variegated. Time and place therefore are matters of substance, not

error; and to understand human development, one must appreciate how variables associated with person, place, and time coalesce to shape the structure and function of behavior and its systematic and successive change (Baltes et al., Chapter 11, this *Handbook,* this volume; Bronfenbrenner & Morris, Chapter 14, this *Handbook,* this volume; Benson et al., Chapter 16, this *Handbook,* this volume; Elder, 1998; Elder, Modell, & Parke, 1993; Magnusson, 1999a, 1999b; Magnusson & Stattin, 1998, Chapter 8, this *Handbook,* this volume; Shweder et al., Chapter 13, this *Handbook,* this volume; Spencer, Chapter 15, this *Handbook,* this volume; Valsiner, Chapter 4, this *Handbook,* this volume).

Accordingly, diversity of person and context has moved into the foreground of the analysis of human development (Lerner, 1991, 1998, 2002, 2004a, 2004b). The dynamic, developmental systems perspective framing the contemporary study of human development does not reject the idea that there may be general laws of human development. Instead, there is an insistence on the presence of individual laws as well and a conviction that any generalizations about groups or humanity as a whole require empirical verification, not preempirical stipulation (Lerner, 2002; Magnusson & Stattin, Chapter 8, this *Handbook,* this volume; Overton, Chapter 2, this *Handbook,* this volume).

To paraphrase the insight of Kluckhohn and Murray (1948), made more than a half century ago, all people are like all other people, all people are like some other people, and each person is like no other person. Today, then, the science of human development recognizes that there are idiographic, differential, and nomothetic laws of human behavior and development (e.g., see Emmerich, 1968; Lerner, 2002). Each person and each group possesses unique and shared characteristics that need to be the core targets of developmental analysis.

Differences, then, among people or groups are not necessarily indicators of deficits in one and strengths in the other (Spencer, Chapter 15, this *Handbook,* this volume). Certainly, it is not useful to frame the study of human development through a model that a priori sets one group as the standard for positive or normative development and where another group, when different from this normative one, is therefore defined as being in deficit. If there is any remaining place in developmental science for a deficit model of humans, it is useful only for understanding the thinking of those individuals who continue to treat diversity as either by definition indicative of error variance or as necessarily reflective of a deficiency of human development.

VESTIGES OF REDUCTIONIST MODELS

Despite the contemporary emphasis on a relational metatheory and on developmental systems theories, the remnants of reductionism and deficit thinking still remain at the periphery of developmental science. These instances of genetic reductionism exist in behavior genetics (e.g., Rowe, 1994; Plomin, 2000), in sociobiology (e.g., Rushton, 1999, 2000), and in at least some forms of evolutionary psychology (e.g., Buss, 2003). These approaches constitute today's version of the biologizing errors of the past, such as eugenics and racial hygiene (Proctor, 1988).

As explained by Collins et al. (2000), these ideas are no longer seen as part of the forefront of scientific theory. Nevertheless, their influence on scientific and public policy persists. Renowned geneticists, such as Bearer (2004), Edelman (1987, 1988), Feldman (e.g., Feldman & Laland, 1996), Ho (1984), Lewontin (2000), Müller-Hill (1988), and Venter (e.g., Venter et al., 2001); and eminent colleagues in comparative and biological psychology, such as Greenberg (e.g., Greenberg & Haraway, 2002; Greenberg & Tobach, 1984), Gottlieb (1997, 2004), Hirsch (1997, 2004), Michel (e.g., Michel & Moore, 1995), and Tobach (1981, 1994; Tobach, Gianutsos, Topoff, & Gross, 1974), alert us to the need for continued intellectual and social vigilance, lest such flawed ideas about genes and human development become the foci of public policies or social programs.

Such applications of counterfactual ideas remain real possibilities, and in some cases unfortunate realities, due at least in part to what Horowitz (2000) described as the affinity of the "Person in the Street" to simplistic models of genetic effects on behavior. These simple and, I must emphasize, erroneous models are used by the Person in the Street to form opinions or to make decisions about human differences and potentials.

Genetic reductionism can, and has, led to views of diversity as a matter of the "haves" and the "have nots" (e.g., Herrnstein & Murray, 1994; Rushton, 1999, 2000). There are, in this view, those people who manifest the normative characteristics of human behavior and development. Given the diversity-insensitive assumptions and research that characterized much of the

history of scholarship in human development even into the 1990s, these normative features of human development were associated with middle-class, European American samples (Graham, 1992; McLoyd, 1998; Shweder et al., Chapter 13, this *Handbook,* this volume; Spencer, 1990, Chapter 15, this *Handbook,* this volume). In turn, there are those people who manifest other characteristics, and these individuals were generally non-European American and non-middle-class. However, if the former group is regarded as normative, then the characteristics of the latter groups are regarded as nonnormative (Gould, 1996). When such an interpretation is forwarded, entry has thus been made down the slippery slope of moving from a description of between-group differences to an attribution of deficits in the latter groups (Lerner, 2002, 2004a, 2004b).

Such an attribution is buttressed when seen through the lens of genetic reductionism because in this conception, it must be genes that provide the final, material, and efficient cause of the characteristics of the latter groups (e.g., see Rowe, 1994; Rushton, 2000). These non-European American or non-middle-class groups are, in the fully tautological reasoning associated with genetic reductionism, behaviorally deficient because of the genes they possess, *and* because of the genes they possess, they have behavioral deficits (e.g., see Rushton, 2000). Simply, the genes that place one in a racial group are the genes that provide either deficits or assets in behavior, and one racial group possesses the genes that are assets and the other group possesses the genes that are deficits.

As shown in Table 1.2, these genetic reductionist ideas may have profound and dire effects on public policies and social programs (Lerner, 2004a, 2004b). The table presents "A" beliefs about whether genetic reductionist ideas are believed to be either (1) true or (2) false. The table presents also "B" public policy and social program implications that would be associated with genetic reductionism were it in fact (1) true or (2) false under either of the two belief conditions involved in "A." Moreover, the "A.2.B.2." quadrant of the table not only presents the policy and program implications of believing that the genetic reductionist conception is believed to be false when it is in fact false. In addition, this quadrant illustrates the policy and program implications of believing developmental systems theory to be true when it is in fact the case. Table 1.2 demonstrates that if genetic reductionism is believed to be true, then irrespective of whether it is in fact true (and, it must be emphasized that it is incontrovertibly *not* true), a range of actions may be promoted that constrain people's freedom of association, reproductive rights, and even survival.

In contrast, Table 1.3 presents the different implications for policies and programs of strict environmental (radical contextual) reductionist theories. As emphasized by Overton (1998, 2003, Chapter 2, this *Handbook,* this volume), split and reductionist conceptions are equally philosophically problematic and empirically flawed. Both of these split conceptions thus can be expected to result in problems for the conduct of science and for the application of science to policies and programs. This comparability of problems between genetic

TABLE 1.2 Policy and Program Implications That Arise If the Hereditarian (Genetic Reductionist) "Split" Conception of Genes (A) Were Believed to Be True or False; and (B) Were in Fact True or False

A. Hereditarian "split" conception is believed to be:			
1. True		2. False	
B. Public policy and social program implications if hereditarian "split" position were in fact:			
1. True	2. False	1. True	2. False
Repair inferior genotypes, making them equal to superior genotypes	Same as A.1, B.1	Wasteful and futile humanitarian policies	Equity, social justice, equal opportunity, affirmative action
Miscegenation laws		Wasteful and futile programs of equal opportunity, affirmative action, equity, and social justice	Celebration of diversity
Restrictions of personal liberties of carriers of inferior genotypes (separation, discrimination, distinct social tracts)		Policies and programs to quell social unrest because of unrequited aspirations of genetically constrained people	Universal participation in civic life
Sterilization		Deterioration of culture and destruction of civil society	Democracy
Elimination of inferior genotypes from genetic pool			Systems assessment and engagement
			Civil society

TABLE 1.3 Policy and Program Implications That Arise If the Strict Environmentalist (Radical Contextual) "Split" Conception of Context (A) Were Believed to Be True or False; and (B) Were in Fact True or False

A. Strict environmental "split" conception is believed to be:			
1. True		2. False	
B. Public policy and social program implications if environmentalist "split" position were in fact:			
1. True	2. False	1. True	2. False
Provide all children with same educational or experiential regimen to maximize their common potential/aptitude Eliminate all individualized educational or training programs Standardized assessments for all children Penalties for parents, schools, and communities when children manifest individual differences in achievement Educate all parents, caregivers, and teachers to act in a standard way in the treatment of all children	Same as A.1, B.1	Wasteful and counterproductive diversity-sensitive policies Wasteful and counterproductive programs based on individual differences Policies and programs to quell social unrest because of unrequited aspirations of people promised that the individualized program they received would make them equal to all other people Deterioration of culture and destruction of civil society	Programs that are sensitive to individual differences and that seek to promote a goodness of fit between individually different people and contexts Affirmative actions to correct ontogenetic or historical inequities in person-context fit Celebration of diversity Universal participation in civic life Democracy Systems assessment and engagement Social justice Civil society

and environmental reductionist approach can be seen in the A.2.B.1. quadrant of Table 1.3. In turn, and as was also the case for the A.2.B.2 quadrant in Table 1.2, this quadrant of Table 1.3 presents the policy and program implications of believing that the split, environmentalist conception is (correctly) believed to be false and is in fact false. As in Table 1.2, then, this quadrant illustrates the policy and program implications of believing developmental systems theory to be true when, in fact, it is true.

Both tables demonstrate that if the split, reductionist conceptions of human development are believed to be true, then irrespective of whether they are in fact true (and they incontrovertibly are *not* true; e.g., see Gottlieb, 1997; Hirsch, 1997; Horowitz, 2000; Lerner, 2002; Venter et al., 2001), a range of actions constraining the freedom of association, reproductive rights, and even survival of people would be promoted. Thus, as shown in Table 1.2, if the hereditarian conception were correctly regarded as false (and conversely the developmental systems conception were correctly seen as true), then policies and programs aimed at social justice and civil society for the diverse families and children of the United States would be promoted. Similarly, Table 1.3 shows that if the developmental systems perspective is correctly seen as true and if the strict environmentalist conception is correctly regarded as false, corresponding results for social justice and civil society are promoted. This result obtains although the strict environmentalist perspective is associated with a set of problematic policy and program implications that differ from those problems linked to the hereditarian perspective.

Despite the theory and research that lends support to a dynamic conception of gene ↔ experience coaction, some proponents of genetic reductionism maintain that concepts and methods regarding genes as separable from context are valid and overwhelmingly, or irrefutably, evident. The media continue to tell this story and, perhaps more often than not, the Person in the Street is persuaded by it.

The challenge that such language use and public discourse represents is not merely one of meeting our scientific responsibility to amend incorrect dissemination of research evidence. Horowitz (2000) reminds us that an additional, and ethical, responsibility is to support social justice. She emphasizes that such action is critical in the face of the simplistically seductive ideas of genetic reductionism, especially when coupled with the deficit model. She explains:

> If we accept as a challenge the need to act with social responsibility then we must make sure that we do not use single-variable words like genes or the notion of innate in such a determinative manner as to give the impression that they constitute the simple answers to the simple questions asked by the Person in the Street lest we contribute to belief systems that will inform social policies that seek to limit

> experience and opportunity and, ultimately, development, especially when compounded by racism and poorly advantaged circumstances. Or, as Elman and Bates and their colleagues said in the concluding section of their book *Rethinking Innateness* (Elman et al., 1998), "If our careless, under-specified choice of words inadvertently does damage to future generations of children, we cannot turn with innocent outrage to the judge and say 'But your Honor, I didn't realize the word was loaded.' " (Horowitz, 2000, p. 8)

Overton (Chapter 2, this *Handbook,* this volume) points also to the need to appreciate the subtlety of language to avoid loading our scientific language with phrases that, on a manifest level, may seem to reject the split thinking of genetic reductionism but, on a deeper, structural level, employ terms that legitimate the language of such thinking remaining part of scientific discourse. He notes:

> In its current split form no one actually asserts that matter, body, brain, genes or society, culture, and environment provide *the* cause of behavior or development: The background idea of one or the other being the privileged determinant remains the silent subtext that continues to shape discussions. The most frequently voiced claim is that behavior and development are the products of the *interactions* of nature and nurture. But interaction itself is generally conceptualized as two split-off pure entities that function *independently* in cooperative and/or competitive ways (e.g., Collins et al., 2000). As a consequence, the debate simply becomes displaced to another level of discourse. At this new level, the contestants agree that behavior and development are determined by *both* nature *and* nurture, but they remain embattled over the relative merits of each entity's essential contribution. (Overton, Chapter 2, this *Handbook,* this volume, p. 33)

Similarly, he explains:

> Moving beyond behavior genetics to the broader issue of biology and culture, conclusions such as "contemporary evidence confirms that the expression of heritable traits depends, often strongly, on experience" (Collins et al., 2000, p. 228) are brought into question for the same reason. Within a relational metatheory, such conclusions fail because they begin from the premise that there are pure forms of genetic inheritance termed "heritable traits" and within relational metatheory such a premise is unacceptable. (Overton, Chapter 2, this *Handbook,* this volume, p. 36)

Whereas contemporary development science rejects the philosophical, theoretical, and (in large part) methodological features of the split thinking associated with genetic reductionist approaches to human development, found in both behavior genetics and sociobiology, subtle and nuanced problems of language continue to suggest that these split approaches to human development remain legitimate. I have noted the potentially enormous negative consequences of such problematic language in our scientific discourse—especially if the Person in the Street believes that employing such terms means that the genetic reductionist ideas about social policy should be countenanced. As a consequence, we must be assiduous and exact in the terms we use to explain why split conceptions in general, and genetic reductionist ones in particular, fail as useful frames for scientific discourse about human development. Indeed, as Lewontin (1981, p. 245) has cautioned, "The price of metaphor is eternal vigilance."

USING THE DEVELOPMENTAL SYSTEMS PERSPECTIVE FOR THEORY, RESEARCH, AND APPLICATION

Developmental systems theories offer another vision of and vocabulary for the role of genes and, more generally, of biology in human development. As illustrated in Tables 1.2 and 1.3, these theories of human development provide a different view of the role of genes in behavior and development and offer a different, if admittedly more complex, story to the Person in the Street (Lerner, 2004a, 2004b). It is predicated on a relational metatheory (Overton, Chapter 2, this *Handbook,* this volume) and thus eschews splits between nature and nurture, organism and environment, or any of the other Cartesian dualities that have been part of the discourse in past historical eras of developmental science (see Cairns & Cairns, Chapter 3, this *Handbook,* this volume; Overton, Chapter 2, this *Handbook,* this volume; Valsiner, Chapter 4, this *Handbook,* this volume). Developmental systems theories stress that genes, cells, tissues, organs, whole organisms, and all other, extraorganism levels of organization composing the ecology of human development are fused in a fully coacting, mutually influential, and therefore dynamic system (Bronfenbrenner, 2005; Bronfenbrenner & Morris, Chapter 14, this *Handbook,* this volume; Elder & Shanahan, Chapter 12, this *Handbook,* this volume; Gottlieb et al., Chapter 5, this *Handbook,* this volume; Thelen & Smith, Chapter 6, this *Handbook,* this volume; Tobach, 1981).

This bidirectional relation between the individual and the complex ecology of human development may be

represented as the individual ↔ context. Because the broadest level of the context is history, temporality is always a part of the fused systems of individual ↔ context relations. Thus the potential for systematic change (plasticity) exists across the life span (Baltes et al., 1998, Chapter 11, this *Handbook,* this volume; Elder, & Shanahan, Chapter 12, this *Handbook,* this volume). Of course, the system that promotes change through the coaction of multiple levels of organization can also act to constrain it. Therefore, this fusion of the potential for both constancy and change makes plasticity relative and not absolute (Lerner, 1984, 2002).

Nevertheless, the temporality of human development and the presence of at least relative plasticity indicate that one may be optimistic that means may be found, at one or more levels of the ecology of human development, to apply developmental science in ways that promote positive development across the life span (Bronfenbrenner, 2005; Ford & Lerner, 1992; Lerner, 2002, 2004c; Magnusson & Stattin, 1998). Moreover, because no two people, even monozygotic (MZ) twins, will have the same history of individual ↔ context relations across the life span, the individuality of each person is lawfully assured (Hirsch, 1970, 1997, 2004). As noted, the presence of over 70 trillion potential human genotypes means that the probability of two genetically identical children arising from any set of parents is quite small—about one in 6.27 billion—and that the probability of two genetically identical but non-MZ children arising from one specific couple is slightly less than one in 160,000 (Hirsch, 2004); thus, there is an obviously low probability that any two people, with the exceptions of MZs, will have an identical biological genotype (to use a redundancy).

However, the probability that two people, including MZs, will have an identical history of events, experiences, and social relationships, that is, a social genotype (to use an oxymoron), is so dismally small as to be equivalent to what most of us would regard as impossible. The integration of biology and context across time means that each person has a developmental trajectory (a dynamically changing phenotype) that is, at least in part, individually distinct.

DIVERSITY—A FUNDAMENTAL ASSET OF HUMAN DEVELOPMENT

Diversity is a distinctive and, in fact, a defining feature of the human life course (Spencer, Chapter 15, this *Handbook,* this volume). Within an individual over time, diversity—seen as the potential for systematic intraindividual change, represents a potential for life-span change. Therefore, diversity, characterized as intraindividual plasticity, is a key asset or developmental strength that may be capitalized on to promote a person's positive, healthy developmental change. Across people, diversity, characterized as interindividual differences, represents a sample of the range of variation that defines the potential material basis for optimizing the course of human life. *Any* individual *may* have a diverse range of potential developmental trajectories and, as well, *all* groups—because of the necessarily diverse developmental paths of the people within them—*will* have a diverse range of developmental trajectories. Diversity, seen as both intraindividual change and as interindividual differences in intraindividual change, is both a strength of individuals and an asset for planning and promoting means to improve the human condition (Benson et al., Chapter 16, this *Handbook,* this volume; Lerner, 2004c; Spencer, Chapter 15, this *Handbook,* this volume).

The diversity of individual ↔ context relations that comprises change within the dynamic developmental system, along with the optimism about improving human life that derives from the relative plasticity of humans, means that it is possible to apply developmental science to promote positive development across the life span (Benson et al., Chapter 16, this *Handbook,* this volume; Damon, 1997, 2004; Lerner, 2002, 2004a, 2004b, 2004c). As such, it is useful to describe the features and implications for science and application of the positive human development perspective derived from developmental systems theories.

FEATURES AND IMPLICATIONS OF A POSITIVE HUMAN DEVELOPMENT PERSPECTIVE

The fused system of individual ↔ context relations that provides the potential for relative plasticity across the life span constitutes a fundamental strength of each person. This strength is present to differing extents in all infants, children, adolescents, adults, and aged individuals. Relative plasticity diminishes across the life span but, as the research of Baltes, in the Berlin Study of Aging (e.g., Baltes et al., 1998, Chapter 11, this *Handbook,* this volume; Baltes & Smith, 2003; Smith et al., 2002), elegantly demonstrates, there is evidence for the presence of plasticity into the 10th and 11th decades of life.

The fused developmental system provides a potential for change not just in people but also in the contexts in which individuals develop. This latter potential means that families, neighborhoods, and cultures are also relatively plastic and that the level of resources—or developmental assets—that they possess at any point in time may also be altered across history. Contextual strengths and assets in support of positive development may be envisioned within the terms suggested by Benson et al. (Chapter 16, this *Handbook,* this volume), as the community nutrients for healthy and positive development. These assets can be grown, aligned, and realigned to improve the circumstances of human development.

At any given place or point in time, both individuals and levels of the context within this plastic developmental system may manifest problems or may be deficient in some aspect of individual, family, or community life that is needed for improved functioning. The presence of plasticity does not mean that people are not poor or that they do not lack social nutrients that would enhance their development. What relative plasticity across the developmental system does mean, however, is that all people have strengths that, when integrated with the developmental assets of communities, may be capitalized on to promote positive change. As such, problems or deficits constitute only a portion of a potentially much larger array of outcomes of individual ↔ context relations. Problems are not inevitable, and they are certainly not fixed in a person's genes.

The role of developmental science is to identify those relations between individual strengths and contextual assets in families, communities, cultures, and the natural environment, and to integrate strengths and assets to promote positive human development (Lerner, 2004a, 2004b). A system that is open for change for the better is also open for change for the worse. The research and applications of developmental scientists should be aimed at increasing the probability of actualization of the healthy and positive portions of the distribution of potential outcomes of individual ↔ context relations.

The scientific agenda of the developmental scientist is more than just to describe and to explain human development. It is also to work to optimize it (Baltes, 1968, 1987, 1997; Baltes et al., Chapter 11, this *Handbook,* this volume). Efforts to enhance human development in its actual ecology are a way to test theoretical ideas about how systemic relations coalesce to shape the course of life. These efforts stand as well as ethical responsibilities of human development scholars, in their roles both as researchers involved with human lives and as citizens of a civil society (Fisher, 1993, 1994, 2003; Fisher, Hoagwood, & Jenson, 1996; Fisher & Tryon, 1990).

Moreover, without a scientific agenda that integrates description, explanation, and optimization, human development science is, at best, an incomplete scholarly endeavor. A developmental science that is devoid of knowledge of the individual and group ranges among diverse groups, and that is devoid of knowledge of the range of assets in diverse contexts, is an incomplete developmental science. It is also inadequate, when seen from the perspective of the need for evidence-based policy and program applications.

FRAMING THE RESEARCH AGENDA OF HUMAN DEVELOPMENT

What becomes, then, the key empirical question for developmental scientists interested in describing, explaining, and promoting positive human development? The key question is actually five (5) interrelated "what" questions:

1. What attributes (?) of
2. What individuals (?) in relation to
3. What contextual/ecological conditions (?) at
4. What points in ontogenetic, family or generational, and cohort or historical, time (?) may be integrated to promote
5. What instances of positive human development?

Answering these questions requires a nonreductionist approach to methodology. Neither biogenic, nor psychogenic or sociogenic approaches are adequate. Developmental science needs integrative and relational models, measures, and designs (Lerner, Dowling, & Chaudhuri, 2005). Examples of such methodology in developmental systems-oriented research are the scholarship of Eccles and her colleagues on stage ↔ environment fit (e.g., Eccles, Wigfield, & Byrnes, 2003); of Damon and his colleagues on the community-based youth charter (Damon, 1997, 2004; Damon & Gregory, 2003); of Benson and his colleagues at Search Institute on the role of developmental assets in positive youth development (e.g., Benson et al., Chapter 16, this *Handbook,* this volume; Leffert et al., 1998; Scales, Benson, Leffert, & Blyth, 2000); of Theokas (2005; Theokas & Lerner, 2005; see too Lerner

et al., 2005) on the role of actual developmental assets associated with families, schools, and neighborhoods on positive youth development; and of Leventhal and Brooks-Gunn (2004), and of Sampson, Raudenbush, and Earls (1997) on the role of neighborhood characteristics on adolescent development.

The methodology employed in individual ↔ context integrative research must also include a triangulation among multiple and, ideally, both qualitative and quantitative approaches to understanding and synthesizing variables from the levels of organization within the developmental system. Such triangulation may usefully involve the classic approach offered by Campbell and Fiske (1959) regarding convergent and discriminant validation through multitrait-multimethod matrix methodology. Diversity-sensitive measures are needed within such approaches, and they must be used within the context of change-sensitive—and hence longitudinal—designs (Cairns & Cairns, Chapter 3, this *Handbook,* this volume; Lerner et al., 2005; Magnusson & Stattin, Chapter 8, this *Handbook,* this volume). Trait measures developed with the goal of excluding variance associated with time and context are not optimal choices in such research. To reflect the richness and strengths of our diverse humanity, our repertoire of measures must be sensitive to the diversity of person variables, such as race, ethnicity, religion, sexual preferences, physical ability status, and developmental status, *and* to the diversity of contextual variables such as family type, neighborhood, community, culture, physical ecology, and historical moment.

It is particularly important that our designs and our measures be sensitive to the different meanings of time. Insightful formulations about the meanings of time in the dynamic developmental system have been provided by Elder (1998; Elder & Shanahan, Chapter 6, this *Handbook,* this volume), Baltes (Baltes et al., Chapter 11, this *Handbook,* this volume), and Bronfenbrenner (2005; Bronfenbrenner & Morris, Chapter 14, this *Handbook,* this volume). Our methods must appraise, then, age, family, and historical time and must be sensitive to the role of both normative and nonnormative historical events in influencing developmental trajectories.

Finally, our designs should be informed not just by colleagues from the multiple disciplines with expertise in the scholarly study of human development. Our methods should be informed as well by the people and communities we study (Lerner, 2002, 2004a, 2004b, 2004c; Villarruel, Perkins, Borden, & Keith, 2003). They, too, are experts about development—a point our colleagues in cultural anthropology, sociology, and community youth development research and practice have been making for several years. Most certainly, participants in our community-based research and applications are experts in the character of development in their families and neighborhoods. Accordingly, research that fails to capitalize on the wisdom of its participants runs the real danger of lacking authenticity and of erecting unnecessary obstacles to the translation of the scholarship of knowledge generation into the scholarship of knowledge application (Jensen, Hoagwood, & Trickett, 1999).

CONCLUSIONS

Contemporary developmental science—predicated on a relational metatheory and focused on the use of developmental systems theories to frame research on dynamic relations between diverse individuals and contexts—constitutes a complex and exciting approach to understanding and promoting positive human development. It offers a means to do good science, informed by philosophically, conceptually, and methodologically useful information from the multiple disciples with knowledge bases pertinent to the integrated, individual ↔ context relations that compose human development. Such science is also more difficult to enact than the ill-framed and methodologically flawed research that followed split and reductionist paths during the prior historical era (Cairns & Cairns, Chapter 3, this *Handbook,* this volume; Overton, Chapter 2, this *Handbook,* this volume; Valsiner, Chapter 4, this *Handbook,* this volume). Such science is also more difficult to explain to the Person in the Street.

As illustrated eloquently by the work discussed in this volume, the richness of the science and the applications that derive from developmental systems perspectives, as well as the internal and ecological validity of this work, are reasons for the continuing and arguably still growing attractiveness of this approach. Moreover, this approach underscores the diverse ways in which humans, in dynamic exchanges with their natural and designed ecologies, can create for themselves and others opportunities for health and positive development. As Bronfenbrenner (2005) eloquently puts it, it is these relations that make human beings human.

Accordingly, the relational, dynamic, and diversity-sensitive scholarship that now defines excellence in developmental science may both document and extend the power inherent in each person to be an active agent in

his or her own successful and positive development (Brandtstädter, Chapter 10, this *Handbook,* this volume; Lerner, 1982; Lerner & Busch-Rossnagel, 1981; Lerner, Theokas, et al., 2005; Magnusson & Stattin, 1998, Chapter 8, this *Handbook,* this volume; Rathunde & Csikszentmihalyi, Chapter 9, this *Handbook,* this volume). A developmental systems perspective leads us to recognize that, if we are to have an adequate and sufficient science of human development, we must integratively study individual and contextual levels of organization in a relational and temporal manner (Bronfenbrenner, 1974; Zigler, 1998). Anything less will not constitute adequate science. And if we are to serve the United States' and the world's individuals, families, and communities through our science, if we are to help develop successful policies and programs through our scholarly efforts, then we must accept nothing less than the integrative temporal and relational model of diverse and active individuals embodied in the developmental systems perspective.

Through such research, developmental science has an opportunity to combine the assets of our scholarly and research traditions with the strengths of our people. We can improve on the often-cited idea of Kurt Lewin (1943), that there is nothing as practical as a good theory. We can, through the application of our science to serve our world's citizens, actualize the idea that nothing is of greater value to society than a science that devotes its scholarship to improving the life chances of all people. By understanding and celebrating the strengths of all individuals, and the assets that exist in their families, communities, and cultures to promote these strengths, we can have a developmental science that may, in these challenging times, help us, as a scientific body *and* as citizens of democratic nations, to finally ensure that there is truly liberty and justice for all.

REFERENCES

Baldwin, J. M. (1906). *Social and ethical interpretations in mental development: A case study in social psychology.* New York: Macmillan. (Original work published 1897)

Baltes, P. B. (1968). Longitudinal and cross-sectional sequences in the Study of Age and Generation Effects. *Human Development, 11,* 145–171.

Baltes, P. B. (1987). Theoretical propositions of life-span developmental psychology: On the dynamics between growth and decline. *Developmental Psychology, 23,* 611–626.

Baltes, P. B. (1997). On the incomplete architecture of human ontogeny: Selection, optimization, and compensation as foundations of developmental theory. *American Psychologist, 52,* 366–380.

Baltes, P. B., Lindenberger, U., & Staudinger, U. M. (1998). Life-span theory in developmental psychology. In W. Damon (Editor-in-Chief) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 1029–1144). New York: Wiley.

Baltes, P. B., & Smith, J. (2003). New frontiers in the future of aging: From successful aging of the young old to the dilemmas of the fourth age. *Gerontology, 49,* 12–135.

Bearer, E. (2004). Behavior as influence and result of the genetic program: Non-kin rejection, ethnic conflict and issues in global health care. In C. Garcia Coll, E. Bearer, & R. M. Lerner (Eds.), *Nature and nurture: The complex interplay of genetic and environmental influences on human behavior and development* (pp. 171–199). Mahwah, NJ: Erlbaum.

Block, J. (1971). *Lives through time.* Berkeley, CA: Bancroft Press.

Bloom, L. (1998). Language acquisition in its developmental context. In W. Damon (Editor-in-Chief) & D. Kuhn & R. S. Siegler (Vol. Eds.), *Handbook of child psychology: Vol. 2. Cognition, perception, and language* (5th ed., pp. 309–370). New York: Wiley.

Boring, E. G. (1950). *A history of experimental psychology* (2nd ed.). New York: Appleton-Century-Crofts.

Bornstein, M. H., & Lamb, M. E. (Eds.). (1999). *Developmental psychology: An advanced textbook* (4th ed.). Mahwah, NJ: Erlbaum.

Bornstein, M. H., & Lamb, M. E. (Eds.). (2005). *Developmental science: An advanced textbook* (5th ed.). Mahwah, NJ: Erlbaum.

Brandtstädter, J. (1998). Action perspectives on human development. In W. Damon (Editor-in-Chief) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 807–863). New York: Wiley.

Brandtstädter, J. (1999). The self in action and development: Cultural, biosocial, and ontogenetic bases of intentional self-development. In J. Brandtstädter & R. M. Lerner (Eds.), *Action and self-development: Theory and research through the life-span* (pp. 37–65). Thousand Oaks, CA: Sage.

Brim, G., & Kagan, J. (Eds.). (1980). *Constancy and change in human development.* Cambridge, MA: Harvard University Press.

Bronfenbrenner, U. (1974). Developmental research, public policy, and the ecology of childhood. *Child Development, 45,* 1–5.

Bronfenbrenner, U. (2005). *Making human beings human.* Thousand Oaks, CA: Sage.

Buss, D. M. (2003). *Evolutionary psychology: The new science of the mind* (2nd ed.). Boston: Allyn & Bacon.

Cairns, R. (1998). The making of developmental psychology. In W. Damon (Editor-in-Chief) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 25–105). New York: Wiley.

Campbell, D. T., & Fiske, D. W. (1959). Convergent and discriminant validation by the multitrait-multimethod matrix. *Psychological Bulletin, 56,* 81–105.

Collins, W. A., Maccoby, E. E., Steinberg, L., Hetherington, E. M., & Bornstein, M. H. (2000). Contemporary research on parenting: The case of nature and nurture. *American Psychologist, 55,* 218–232.

Damon, W. (1997). *The youth charter: How communities can work together to raise standards for all our children.* New York: Free Press.

Damon, W. (Ed.). (1998). *Handbook of child psychology* (5th ed.). New York: Wiley.

Damon, W. (2004). What is positive youth development? *The Annals of the American Academy of Political and Social Science, 591*(1), 13–24.

Damon, W., & Gregory, A. (2003). Bringing in a new era in the field of youth development. In R. M. Lerner, F. Jacobs, & D. Wertlieb (Eds.), *Applying developmental science for youth and families—Historical and theoretical foundations: Vol. 1. Handbook of applied developmental science—Promoting positive child, adolescent, and family development through research, policies, and programs* (pp. 407–420). Thousand Oaks, CA: Sage.

Damon, W. (Editor-in-Chief) & Lerner, R. M. (Vol. Ed.). (1998). *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed.). New York: Wiley.

Dewey, J. (1916). *Democracy and education: An introduction to the philosophy of education.* New York: Macmillan.

Duncan, G. J., Magnuson, K. A., & Ludwig, J. (2004). The endogeneity problem in developmental studies. *Research in Human Development, 1*(1/2), 59–80.

Eccles, J., Wigfield, A., & Byrnes, J. (2003). Cognitive development in adolescence. In I. B. Weiner (Editor-in-Chief) & R. M. Lerner, M. A. Easterbrooks, & J. Mistry (Eds.), *Handbook of psychology: Vol. 6. Developmental psychology* (pp. 325–350). New York: Wiley.

Edelman, G. M. (1987). *Neural Darwinism: The theory of neuronal group selection.* New York: Basic Books.

Edelman, G. M. (1988). *Topobiology: An introduction to molecular biology.* New York: Basic Books.

Elder, G. H., Jr. (1998). The life course and human development. In W. Damon (Editor-in-Chief) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 939–991). New York: Wiley.

Elder, G. H., Modell, J., & Parke, R. D. (1993). Studying children in a changing world. In G. H. Elder, J. Modell, & R. D. Parke (Eds.), *Children in time and place: Developmental and historical insights* (pp. 3–21). New York: Cambridge University Press.

Elman, J. L., Bates, E. A., Johnson, M. H., Karmiloff-Smith, A., Parisi, D., & Plunkett, K. (1998). *Rethinking innateness: A connectionist perspective on development (neural network modeling and connectionism).* Cambridge, MA: MIT Press.

Emmerich, W. (1968). Personality development and concepts of structure. *Child Development, 39,* 671–690.

Feldman, M. W., & Laland, K. N. (1996). Gene-culture coevolutionary theory. *Trends in Ecology and Evolution, 11,* 453–457.

Fisher, C. B. (1993). Integrating science and ethics in research with high-risk children and youth. *SRCD Social Policy Report, 7,* 1–27.

Fisher, C. B. (1994). Reporting and referring research participants: Ethical challenges for investigators studying children and youth. *Ethics and Behavior, 4,* 87–95.

Fisher, C. B. (2003). *Decoding the ethics code: A practical guide for psychologists.* Thousand Oaks, CA: Sage.

Fisher, C. B., Hoagwood, K., & Jensen, P. (1996). Casebook on ethical issues in research with children and adolescents with mental disorders. In K. Hoagwood, P. Jensen, & C. B. Fisher (Eds.), *Ethical issues in research with children and adolescents with mental disorders* (pp. 135–238). Hillsdale, NJ: Erlbaum.

Fisher, C. B., & Tryon, W. W. (1990). Emerging ethical issues in an emerging field. In C. B. Fisher & W. W. Tryon (Eds.), *Ethics in applied developmental psychology: Emerging issues in an emerging field* (pp. 1–15). Norwood, NJ: Ablex.

Flavell, J. H. (1963). *The developmental psychology of Jean Piaget.* New York: Van Nostrand.

Ford, D. H., & Lerner, R. M. (1992). *Developmental systems theory: An integrative approach.* Newbury Park, CA: Sage.

Garcia Coll, C., Bearer, E., & Lerner, R. M. (Eds.). (2004). *Nature and nurture: The complex interplay of genetic and environmental influences on human behavior and development.* Mahwah, NJ: Erlbaum.

Gottlieb, G. (1997). *Synthesizing nature-nurture: Prenatal roots of instinctive behavior.* Mahwah, NJ: Erlbaum.

Gottlieb, G. (2004). Normally occurring environmental and behavioral influences on gene activity. In C. Garcia Coll, E. Bearer, & R. M. Lerner (Eds.), *Nature and nurture: The complex interplay of genetic and environmental influences on human behavior and development* (pp. 85–106). Mahwah, NJ: Erlbaum.

Gould, S. J. (1981). *The mismeasure of man.* New York: Norton.

Gould, S. J. (1996). *The mismeasure of man* (Rev. ed.). New York: Norton.

Graham, S. (1992). Most of the subjects were White and middle class: Trends in published research on African Americans in selected APA journals, 1970–1989. *American Psychologist, 47,* 629–639.

Greenberg, G., & Haraway, M. M. (2002). *Principles of comparative psychology.* Boston: Allyn & Bacon.

Greenberg, G., & Tobach, E. (Eds.). (1984). *Behavioral evolution and integrative levels.* Hillsdale, NJ: Erlbaum.

Herrnstein, R. J., & Murray, C. (1994). *The bell curve: Intelligence and class structure in American life.* New York: Free Press.

Hirsch, J. (1970). Behavior-genetic analysis and its biosocial consequences. *Seminars in Psychiatry, 2,* 89–105.

Hirsch, J. (1997). Some history of heredity-vs.-environment, genetic inferiority at Harvard (?), and the (incredible) Bell Curve. *Genetica, 99,* 207–224.

Hirsch, J. (2004). Uniqueness, diversity, similarity, repeatability, and heritability. In C. Garcia Coll, E. Bearer, & R. M. Lerner (Eds.), *Nature and nurture: The complex interplay of genetic and environmental influences on human behavior and development* (pp. 127–138). Mahwah, NJ: Erlbaum.

Ho, M.-W. (1984). Environment and heredity in development and evolution. In M.-W. Ho & P. T. Saunders (Eds.), *Beyond neo-Darwinism: An introduction to the new evolutionary paradigm* (pp. 267–289). London: Academic Press.

Horowitz, F. D. (2000). Child development and the PITS: Simple questions, complex answers, and developmental theory. *Child Development, 71,* 1–10.

Jensen, P., Hoagwood, K., & Trickett, E. (1999). Ivory towers or earthen trenches? Community collaborations to foster "real world" research. *Applied Developmental Science, 3*(4), 206–212.

Kluckhohn, C., & Murray, H. (1948). Personality formation: The determinants. In C. Kluckhohn & H. Murray (Eds.), *Personality in nature, society, and culture.* New York: Knopf.

Kuhn, T. S. (1962). *The structure of scientific revolutions.* Chicago: University of Chicago Press.

Laub, J. H., & Sampson, R. J. (2004). Strategies for bridging the quantitative and qualitative divide: Studying crime over the life course. *Research in Human Development, 1,*(1/2) 81–99.

Leffert, N., Benson, P., Scales, P., Sharma, A., Drake, D., & Blyth, D. (1998). Developmental assets: Measurement and prediction of risk behaviors among adolescents. *Applied Developmental Science, 2*(4), 209–230.

Lerner, R. M. (1977). Biographies of S. DeSanctis, J. Dewey, A. Gesell, F. Goodenough, J. Locke, L. M. Terman, H. Werner, & L.

Witmer. In B. B. Wolman (Ed.), *International encyclopedia of neurology, psychiatry, psychoanalysis, and psychology.* New York: Van Nostrand Reinhold.

Lerner, R. M. (1982). Children and adolescents as producers of their own development. *Developmental Review, 2,* 342–370.

Lerner, R. M. (1984). *On the nature of human plasticity.* New York: Cambridge University Press.

Lerner, R. M. (1991). Changing organism-context relations as the basic process of development: A developmental contextual perspective. *Developmental Psychology, 27,* 27–32.

Lerner, R. M. (1998). Theories of human development: Contemporary perspectives. In W. Damon (Editor-in-Chief) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol 1. Theoretical models of human development* (5th ed., pp. 1–24). New York: Wiley.

Lerner, R. M. (2002). *Concepts and theories of human development* (3rd ed.). Mahwah, NJ: Erlbaum.

Lerner, R. M. (2004a). Innovative methods for studying lives in context: A view of the issues. *Research in Human Development, 1*(1), 5–7.

Lerner, R. M. (2004b). Genes and the promotion of positive human development: Hereditarian versus developmental systems perspectives. In C. Garcia Coll, E. Bearer, & R. M. Lerner (Eds.), *Nature and nurture: The complex interplay of genetic and environmental influences on human behavior and development* (pp. 1–33). Mahwah, NJ: Erlbaum.

Lerner, R. M. (2004c). *Liberty: Thriving and civic engagement among America's youth.* Thousand Oaks, CA: Sage.

Lerner, R. M., & Busch-Rossnagel, N. A. (Eds.). (1981). *Individuals as producers of their development: A life-span perspective.* New York: Academic Press.

Lerner, R. M., Dowling, E., & Chaudhuri, J. (2005). Methods of contextual assessment and assessing contextual methods: A developmental contextual perspective. In D. M. Teti (Ed.), *Handbook of research methods in developmental psychology* (pp. 183–209). Cambridge, MA: Blackwell.

Lerner, R. M., Lerner, J. V., Alermigi, J., Theokas, C., Phelps, E., Gestsdottir, S., et al. (2005). Positive youth development, participation in community youth development programs, and community contributions of fifth grade adolescents: Findings from the first wave of the 4-H Study of Positive Youth Development. *Journal of Early Adolescence, 25,* 17–71.

Lerner, R. M., Theokas, C., & Jelicic, H. (2005). Youth as active agents in their own positive development: A developmental systems perspective. In W. Greve, K. Rothermund, & D. Wentura (Eds.), *The adaptive self: Personal continuity and intentional self-development* (pp. 31–47). Göttingen, Germany: Hogrefe/Huber.

Leventhal, T., & Brooks-Gunn, J. (2004). Diversity in developmental trajectories across adolescence: Neighborhood influences. In R. M. Lerner & L. Steinberg (Eds.), *Handbook of Adolescent Psychology* (pp. 451–486). New York: Wiley.

Lewin, K. (1935). *A dynamic theory of personality.* New York: McGraw-Hill.

Lewin, K. (1943). Psychology and the process of group living. *Journal of Social Psychology, 17,* 113–131.

Lewin, K. (1954). Behavior and development as a function of the total situation. In L. Carmichael (Ed.), *Manual of child psychology* (2nd ed., pp. 791–844). New York: Wiley.

Lewontin, R. C. (1981). On constraints and adaptation. *Behavioral and Brain Sciences, 4,* 244–245.

Lewontin, R. C. (2000). *The triple helix.* Cambridge, MA: Harvard University Press.

Maier, N. R. F., & Schneirla, T. C. (1935). *Principles of animal behavior.* New York: McGraw-Hill.

Magnusson, D. (1999a). Holistic interactionism: A perspective for research on personality development. In L. A. Pervin & O. P. John (Eds.), *Handbook of personality: Theory and research* (2nd ed., pp. 219–247). New York: Guilford Press.

Magnusson, D. (1999b). On the individual: A person-oriented approach to developmental research. *European Psychologist, 4,* 205–218.

Magnusson, D., & Stattin, H. (1998). Person-context interaction theories. In W. Damon (Editor-in-Chief) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 685–759). New York: Wiley.

McArdle, J. J., & Nesselroade, J. R. (2003). Growth curve analysis in contemporary psychological research. In I. B. Weiner (Editor-in-Chief) & J. A. Schinka & W. F. Velicer (Vol. Eds.), *Handbook of psychology: Research methods in psychology* (Vol. 2, pp. 447–477). Hoboken, NJ: Wiley.

McLoyd, V. C. (1998). Children in poverty: Development, public policy, and practice. In W. Damon (Editor-in-Chief) & I. E. Sigel & K. A. Renninger (Vol. Eds.), *Handbook of psychology: Vol. 4. Child psychology in practice* (pp. 135–208). New York: Wiley.

Michel, G., & Moore, C. L. (1995). *Developmental psychobiology: An interdisciplinary science.* Cambridge, MA: MIT Press.

Mishler, E. G. (2004). Historians of the self: Restorying lives, revising identities. *Research in Human Development, 1*(1/2), 101–121.

Molenaar, P. C. M. (2004). A manifesto on psychology as a idiographic science: Bringing the person back into scientific psychology, this time forever. *Measurement, 2,* 201–218.

Müller-Hill, B. (1988). *Murderous science: Elimination by scientific selection of Jews, Gypsies, and others—Germany 1933–1945* (G. R. Fraser, Trans.). New York: Oxford University.

Nesselroade, J. R., & Ram, N. (2004). Studying intraindividual variability: What we have learned that will help us understand lives in context. *Research in Human Development, 1*(1/2), 9–29.

Novikoff, A. B. (1945a). The concept of integrative levels and biology. *Science, 101,* 209–215.

Novikoff, A. B. (1945b). Continuity and discontinuity in evolution. *Science, 101,* 405–406.

Overton, W. F. (1998). Developmental psychology: Philosophy, concepts, and methodology. In W. Damon (Editor-in-Chief) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 107–187). New York: Wiley.

Overton, W. F. (2003). Development across the life span. In I. B. Weiner (Editor-in-Chief) & R. M. Lerner, M. A. Easterbrooks, & J. Mistry (Vol. Eds.), *Handbook of psychology: Vol. 6. Developmental psychology* (pp. 13–42). New York: Wiley.

Phelps, E., Furstenberg, F. F., & Colby, A. (2002). *Looking at lives: American Longitudinal Studies of the Twentieth Century.* New York: Russell Sage Foundation.

Piaget, J. (1923). La pensee l'enfant. *Archives of Psychology, Geneva, 18,* 273–304.

Plomin, R. (2000). Behavioural genetics in the 21st century. *International Journal of Behavioral Development, 24,* 30–34.

Proctor, R. N. (1988). *Racial hygiene: Medicine under the Nazis.* Cambridge, MA: Harvard University Press.

Reese, H. W., & Overton, W. F. (1970). Models of development and theories of development. In L. R. Goulet & P. B. Baltes (Eds.), *Lifespan developmental psychology: Research and theory* (pp. 115–145). New York: Academic Press.

Rowe, D. C. (1994). *The limits of family influence: Genes, experience, and behavior.* New York: Guilford Press.

Rushton, J. P. (1999). *Race, evolution, and behavior* (Special abridged ed.). New Brunswick, NJ: Transaction.

Rushton, J. P. (2000). *Race, evolution, and behavior* (2nd special abridged ed.). New Brunswick, NJ: Transaction.

Sampson, R., Raudenbush, S. W., & Earls, F. (1997). Neighborhoods and violent crime: A multilevel study of collective efficacy. *Science, 277,* 918–924.

Scales, P., Benson, P., Leffert, N., & Blyth, D. A. (2000). The contribution of developmental assets to the prediction of thriving among adolescents. *Applied Developmental Science, 4,* 27–46.

Singer, D., & Willett, J. B. (2003). *Applied longitudinal data analysis: Modeling change and event occurrence.* New York: Oxford University Press.

Skrondal, A., & Rabe-Hesketh, S. (2004). *Generalized latent variable modeling: Multilevel, longitudinal, and structural equation models.* Boca Raton, FL: Chapman & Hall.

Smith, J., Maas, I., Mayer, K. U., Helmchen, H., Steinhagen-Thiessen, E., & Baltes, P. B. (2002). Two-wave longitudinal findings from the Berlin aging study: Introduction to a collection of articles. *Journal of Gerontology: Psychological Sciences, 57B*(6), 471–473.

Spelke, E. S., & Newport, E. L. (1998). Nativism, empiricism, and the development of knowledge. In W. Damon (Editor-in-Chief) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 275–340). New York: Wiley.

Spencer, M. B. (1990). Development of minority children: An introduction. *Child Development, 61,* 267–269.

Stern, W. (1914). *Psychologie der frühen Kindheit bis zum sechsten Lebensiahr.* Leipzig: Quelle & Meyer.

Suomi, S. J. (2004a). How gene-environment interactions shape biobehavioral development: Lessons from studies with Rhesus monkeys. *Research in Human Development, 1*(3), 205–222.

Suomi, S. J. (2004b). How gene-environment interactions influence emotional development in Rhesus monkeys. In C. Garcia Coll, E. Bearer, & R. M. Lerner (Eds.), *Nature and nurture: The complex interplay of genetic and environmental influences on human behavior and development* (pp. 35–51). Mahwah, NJ: Erlbaum.

Theokas, C. (2005, February). *Promoting positive development in adolescence: Measuring and modeling observed ecological assets.* Unpublished Doctoral Dissertation. Medford, MA: Tufts University.

Theokas, C., & Lerner, R. M. (2005). Promoting positive youth development across variations in socioeconomic status and poverty: Framing the Corwin and Bradley structural equation modeling approach within a developmental systems perspective. In A. Acock, K. Allen, V. L. Bengtson, D. Klein, & P. Dilworth-Anderson (Eds.), *Sourcebook of family theory and research* (pp. 488–492). Thousand Oaks, CA: Sage.

Tobach, E. (1981). Evolutionary aspects of the activity of the organism and its development. In R. M. Lerner & N. A. Busch-Rossnagel (Eds.), *Individuals as producers of their development: A life-span perspective* (pp. 37–68). New York: Academic Press.

Tobach, E. (1994). Personal is political is personal is political. *Journal of Social Issues, 50,* 221–224.

Tobach, E., Gianutsos, J., Topoff, H. R., & Gross, C. G. (1974). *The four horsemen: Racism, sexism, militarism and social Darwinism* (pp. 67–80). New York: Behavioral Publications.

Tobach, E., & Greenberg, G. (1984). The significance of T. C. Schneirla's contribution to the concept of levels of integration. In G. Greenberg & E. Tobach (Eds.), *Behavioral evolution and integrative levels* (pp. 1–7). Hillsdale, NJ: Erlbaum.

Valsiner, J. (1998). The development of the concept of development: Historical and epistemological perspectives. In W. Damon (Editor-in-Chief) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 189–232). New York: Wiley.

Venter, J. C., Adams, M. D., Meyers, E. W., Li, P. W., Mural, R. J., et al. (2001). The sequence of the human genome. *Science, 291,* 1304–1351.

Villarruel, F. A., Perkins, D. F., Borden, L. M., & Keith, J. G. (Eds.). (2003). *Community youth development: Programs, policies, and practices.* Thousand Oak, CA: Sage.

von Bertalanffy, L. (1933). *Modern theories of development.* London: Oxford University Press.

von Eye, A. (1990). *Statistical methods in longitudinal research: Principles and structuring change.* New York: Academic Press.

von Eye, A., & Bergman, L. R. (2003). Research strategies in developmental psychopathology: Dimensional identity and the person-oriented approach. *Development and Psychopathology, 15,* 553–580.

von Eye, A., & Gutiérrez Peña, E. (2004). Configural frequency analysis: The search for extreme cells. *Journal of Applied Statistics, 31,* 981–997.

Watson, J. B. (1928). *Psychological care of infant and child.* New York: Norton.

Willett, J. B. (2004). Investigating individual change and development: The multilevel model for change and the method of latent growth modeling. *Research in Human Development, 1*(1/2), 31–57.

Young, C. H., Savola, K. L., & Phelps, E. (1991). *Inventory of longitudinal studies in the social sciences.* Newbury Park, CA: Sage.

Zigler, E. (1998). A place of value for applied and policy studies. *Child Development, 69,* 532–542.

CHAPTER 2

Developmental Psychology: Philosophy, Concepts, Methodology

WILLIS F. OVERTON

METATHEORY 20
THE CONCEPT OF DEVELOPMENT 22
What Changes in Development: Expressive-Constitutive and Instrumental-Communicative Functions of Behavior 22
The Nature of Developmental Change: Transformational and Variational 25
A Unified Concept of Development 28
SPLIT AND RELATIONAL METATHEORIES 30
Split Metatheory 30
Relational Metatheory 32
DEVELOPMENT AND EVOLUTION: RELATIONAL HISTORY AND RELATIONAL MODELS 39
DEVELOPMENT AND EVOLUTION: SPLIT APPROACHES 41
DEVELOPMENTALLY ORIENTED EMBODIED ACTION METATHEORY 47
Embodiment 47
Person-Centered Embodiment, Action, and Development 49
EPISTEMOLOGICAL-ONTOLOGICAL ISSUES 54
Plato and Aristotle and the Relational Developmental Tradition 55
Modernity and the Rise of the Split Tradition 56
Modernity and the Elaboration of Relational Metatheory 58
The Marxist Split Tradition 65
Culture and Development in Split and Relational Metatheories 66
Pragmatism 68
METHODOLOGY: EXPLANATION AND UNDERSTANDING 70
Split Mechanical Explanation 71
Relational Scientific Methodology 75
CONCLUSIONS 80
REFERENCES 80

Throughout its history, psychology and its sub disciplines, including developmental psychology, have been captives of numerous fundamental contradictory positions. These basic dichotomies, called *antinomies,* include subject-object, mind-body, nature-nurture, biology-culture, intrapsychic-interpersonal, structure-function, stability-change, continuity-discontinuity, observation-reason, universal-particular, ideas-matter, unity-diversity, and individual-society. While often explicitly denying the relevance of philosophy to its operations, psychology has implicitly used the philosophical assumptions of a seventeenth-century ontological dualism, a nineteenth-century epistemological empiricism, and an early twentieth-century neopositivism, to build a standard orthodox approach to the resolution of the antinomies. This approach elevates one concept of the pair to a privileged position, builds a research program on this concept, and then strives to demonstrate observationally that the nonprivileged concept can be denied or marginalized. This standard approach to the antinomies has never been successful because it ultimately represents merely an attempt to suppress one concept, and one research program's suppressed concept becomes another program's privileged base. In the nature-nurture battles, for example, while virtually all combatants these days acknowledge some type of interaction, it is a rare program that promotes nature and nurture as co-equal reciprocally determined complementary processes (Overton, 2004a).

This chapter explores how basic conceptual assumptions have historically shaped, and how they continue to shape, proposed solutions to empirical problems including, very fundamentally, the antinomy problem. The focus

of the chapter is on development. We look at the impact various conceptual models have on our very understanding of the concept of development and, as a consequence, on the theories and methods designed to empirically explore development across several series, including *phylogenesis* (development of the species—evolution), *embryogenesis* (development of the embryo), *ontogenesis* (development of the individual across the life span), *microgenesis* (development across short time spans), *orthogenesis* (normal development), and *pathogenesis* (development of pathology, here psychopathology). My thesis is that historically two broad abstract metatheories, often termed *worldviews,* have constituted the basic conceptual contexts within which alternative ideas about the nature and operations of empirical science, psychology, and especially developmental psychology, have emerged and grown. *Split metatheory,* based on a view of the world as decomposable into a foundation of fixed pure forms, has yielded the antinomies, and associated concepts such as foundationalism, elementarism, atomism, reductionism. *Relational metatheory,* emerging from a view of the world as a series of active, ever-changing forms replaces the antinomies with a fluid dynamic holism and associated concepts such as *self-organization, system,* and *the synthesis of wholes.*

Because the focus of the chapter is a conceptual analysis of development—its concepts, theories, and metatheories—a discussion of the place of concepts in any empirical science, along with a discussion of the nature and functioning of those fundamental conceptual systems called *metatheories,* represent a necessary preamble. Wittgenstein (1958) once remarked that "in psychology there are empirical methods and conceptual confusions" (p. xiv). To avoid validating such a pessimistic judgment, it is essential that psychology, or any empirical science, focus some significant portion of its energy on the clarification of concepts that are central to its theories and methods. Conceptual clarification and the exploration of conceptual foundations have traditionally been the principle provinces of philosophy, and therein lies the rub. Within the psychological community, philosophical thought—and, as a consequence, any focus on conceptual clarification—has tended to be assigned the role of the anti-science. As Robert Hogan (2001) commented, "Our training and core practices concern research methods; the discipline is . . . deeply skeptical of philosophy. We emphasize methods for the verification of hypotheses and minimize the analysis of the concepts entailed by the hypotheses" (p. 27). However, Hogan also raises a warning flag as he goes on to note that "all the empiricism in the world can't salvage a bad idea" (p. 27). Broadly, the marginalization of all things philosophical, and, hence, the marginalization of any extended examination of conceptual foundations, has rested on a forced dichotomy, which locates philosophy in a space of reason and reflection split off from observation and experimentation, and psychology in a space of observation and experimentation split off from reason and reflection.

This marginalization of conceptual foundations in contemporary psychology is ironically itself the product of the acceptance of some basic ontological and epistemological—hence philosophical—assumptions. These assumptions begin with the idea of splitting reason from observation, and follow with the epistemological notion that knowledge and, indeed, reason itself originates in observation and only observation. These assumptions then lead to a particular definition of scientific method as entailing observation, causation, and induction-deduction, and only observation, causation, and induction-deduction. Morris R. Cohen (1931), a philosopher, captured the spirit of this conceptual splitting long ago when he criticized its "anti-rationalism . . . bent on minimizing the role of reason in science" and pointed out that the motto of this approach is the split "Don't think [reason]; find out [observe]" (p. 76).

Over the past 50 or so years, many powerful arguments have been mounted against this split between reason and observation and the subsequent denial of reflection. Some of these arguments are discussed later in this chapter. Indeed, enough arguments have emerged that the attitude itself has often been declared dead, as in the claim that the methodology called *neopositivism* is dead. Yet, like the mythical Hydra, new forms of this split continue to appear and exert a contextual shaping effect. The split is often found in the disparagement of reason itself, as in some contemporary versions of so-called postmodern thought. Sometimes, the split is found in explicit and implicit attacks on theory, as in a particular rhetoric that states that all theories must be induced directly from observations (i.e., must be "data based" or "data driven"). It is also found in a dogmatic retort given to any reflective critique—"that's just philosophy." Often, it is found in the celebration of the analytic over the synthetic, as when analytic methods of observation are presented as the only acceptable tools for expanding our knowledge domain, with the consequence that theory is often reduced to method, as when flow charts illustrating possible relations among empirical variables are offered as

guiding theories. Frequently, it is found in the valuing of the instrumental over the expressive, as when behavior is understood *only* in the context of the success or failure of adjustment to some external criteria and *never* as an index or expression of an embodied self-organizing system that constitutes the psychological subject.

In whatever of these or other multiple forms it appears, the significant point is that the split between reason and observation, along with the subsequent marginalization of reason and reflection, is itself the direct consequence of a conceptual position favoring a particular approach to knowledge building. This conceptual position operates as a foundation for building other concepts, theories, and methods. The position is not in itself a given in any self-evident or directly observational fashion, but simply a specific claim, and, as with any claim or argument, reasons must be presented to support the value of the claim. These reasons and the claim itself require reflection and clarification before they can be rationally accepted as valid or rejected as invalid. It is just possible that the split between reason and observations is part of a very bad foundation for our discipline, but this cannot be decided without further exploring conceptual issues. To paraphrase Hogan, all the observation in the world can't salvage conceptual confusions.

METATHEORY

In scientific discussions, the basic concepts to be explored in this chapter are often termed *metatheoretical.* Metatheories transcend (i.e., "meta") theories in the sense that they define the context in which theoretical concepts are constructed, just as a foundation defines the context in which a house can be constructed. Further, metatheory functions not only to ground, constrain, and sustain theoretical concepts but also functions to do the same thing with observational methods of investigation. When specifically discussing background ideas that ground methods, these are here termed *metamethods. Methodology* would also be an appropriate term here if this were understood in its broad sense as a set of principles that guide empirical inquiry (Asendorpf & Valsiner, 1992) and not as particular methods themselves.

The primary function of metatheory—including metamethod—is to provide a rich source of concepts out of which theories and methods grow. Metatheory also provides guidelines that help to avoid conceptual confusions and what may ultimately be unproductive ideas and methods.

Any discussion of metatheory requires a constant reminder of the importance of maintaining distinctions between various levels of analysis or discourse (Figure 2.1). Theories and methods refer directly to the empirical world, while metatheories and metamethods refer to the theories and methods themselves. The most concrete and circumscribed level of analysis or discourse is the *observational level.* This is one's current commonsense level of conceptualizing—not pristine, interpretation free "seeing"—the nature of objects and events in the world. For example, one might describe the developmental changes in some domain as smooth and continuous, abrupt and discontinuous, or some combination of both. Regardless of which characterization is chosen, or whether this characterization is treated as a narrow observation or a broad inductive inference, the assertion functions at the observational level of dealing with the world.

Although the observational, commonsense, or folk level of analysis has a sense of immediacy and concreteness, we can and do focus our attention on this common-

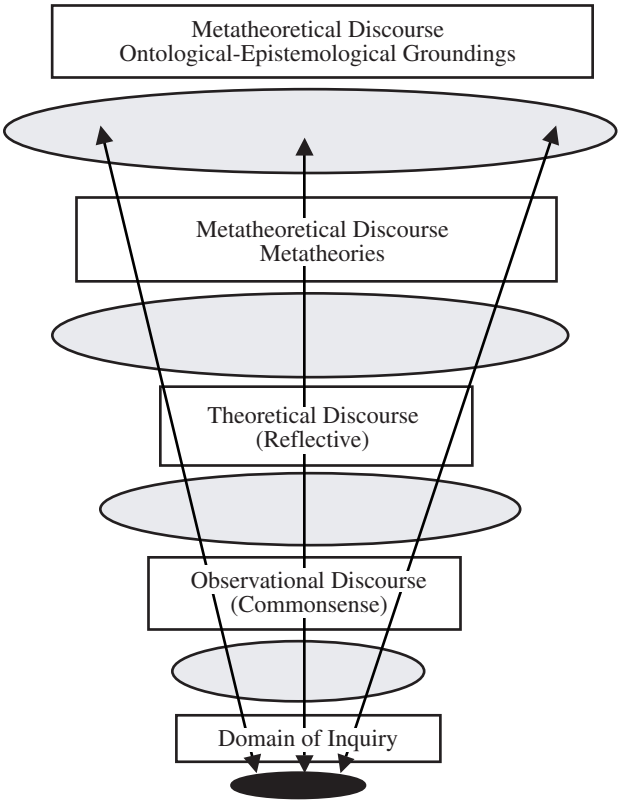


Figure 2.1 Levels of discourse in understanding a domain of inquiry.

sense understanding and we do think about it. In so doing, we have moved to a *reflective level* of analysis, and here the first critical differentiation is the *theoretical level* of discourse. Here, thought is about organizing and reformulating observational understandings in a broader and more abstract field. At the theoretical level, concepts are *about* the observational level and these range from informal hunches to highly refined theories about the nature of things, including human behavior and change. Classical developmental theories such as Piaget's, Vygotsky's, and Werner's, for example, contain theoretical principles (e.g., stages) that hypothesize that ultimately a combination of continuous and discontinuous changes will best define human development. Skinnerian and social learning theories alternatively have hypothesized that all change is best represented as strictly continuous.

Beyond the theoretical level, the next level of reflective thought is the *metatheoretical level* of analysis. Here, thought is about basic concepts that impact on both the theoretical and observational level. A *metatheory* itself is a set of rules, principles, or a story (narrative), that both describes and prescribes what is acceptable and unacceptable as theory—the means of conceptual exploration of any scientific domain. For example, in the metatheory termed "atomism" only continuous change is possible and thus only theories committed to strict continuity are formulated. A *metamethod* is also a set of rules, principles, or a story, but this story describes and prescribes the nature of acceptable methods—the means of observational exploration—in a scientific discipline. When metatheoretical ideas—including metamethod—are tightly interrelated and form a coherent set of concepts, the set is often termed a *model* or *paradigm.* These coherent sets can themselves form a hierarchy in terms of increasing generality of application. Thus, a model that contains the basic concepts from which a theory of memory will be constructed is a relatively low level model because it applies only to memory. Models such as "developmental systems" (e.g., Lerner, 2002) or "equilibrium models" (see Valsiner 1998a) apply to a number of domains including social, cognitive, and emotional domains and function at a higher level in the hierarchy. The hierarchical dimension of any given set of metatheoretical ideas also forms a coherently interrelated system of ideas, and the model operating at the pinnacle of this hierarchy is termed a *worldview* (Overton, 1984). Worldviews are composed of coherent sets of *epistemological* (i.e., issues of knowing) and *ontological* (i.e., issues of reality) principles. In this chapter, much of the discussion concerns ideas that have a very high range of application.

Metatheories and metamethods are closely interrelated and intertwined. For example, when considering the very nature of development, a prevailing metatheory may claim that change of form (transformational change) is a legitimate and important part of the understanding of developmental change. If a prevailing metatheory asserts the legitimacy of transformational change, then theories of development will include some type of "stage," "phase," or "level" because these are theoretical concepts used to designate transformational change: If transformational change and stage, phase, or level are part of one's metatheory, then the related metamethod will prescribe the significance of methods, which assess patterns and sequence of patterns appropriate for empirically examining these concepts in any given specific domain. If a metatheory prescribes that transformational change is unimportant to our understanding of development, then any theoretical concepts of stage, phase, or level, will be viewed negatively, and methods of pattern and sequential assessment will be understood to be of marginal interest.

Broadly, a metatheory presents a vision of the nature of the world and the objects of that world (e.g., a metatheory might present a picture of the child as an "active agent" who "constructs" his or her known world, but another metatheory might picture the child as a "recording device" that "processes" information). A metamethod presents a vision of the tools that will be most adequate to explore the world described by the metatheory.

Any rich understanding of the impact of the metatheoretical requires an historical appreciation of the emergence of specific alternative metatheoretical approaches to knowledge. Developmental psychology was born and spent its early years in a curious metatheoretical world. This world, which began in the seventeenth century, has been called the modern world or "modernity." In the past century, the modern world has undergone major crises and these have formed the context for alternative contemporary metatheories. Before discussing specific metatheories and their historical origins, an examination of the broad ways that metatheory impacts how we understand the very nature of development requires attention. This discussion establishes a developmental framework serving as a general context for the remainder of the chapter.

THE CONCEPT OF DEVELOPMENT

When exploring nature of development the one feature that virtually all agree on is that above all else development is about *change*. It is common to speak of the development of various art forms, societies, different economic systems, religion, philosophy, science, and so on, and in each case changes that the area goes through are the focus of attention. In developmental psychology, the situation is the same. As a branch of psychology, developmental psychology considers changes in behavior and the processes implied by the behavior such as intending, thinking, perceiving, and feeling. As a developmental psychology, the focus is upon these changes as they occur across the entire life span from conception to death, or within certain periods, such as infancy, childhood, adolescence, adulthood, and the late mature years.

Although the focus on change is straightforward and noncontroversial, major problems arise when considering whether every type of change should be accepted as developmental and, if not, what is the peculiar nature of the change we call developmental. Perhaps, general agreement would occur that the types of behavioral changes that occur when we become fatigued or tired would not be termed developmental change. But what about other changes that are transitory or easily reversed? For example, if someone is struck on the head they may change from a conscious to a nonconscious state; is this development change? Or, a pigeon can be trained to peck at a button when a light comes on, and then trained to not peck at the button when the light comes on; is this development change? The answer to these and other questions about the nature of development change depend to a significant degree on the metatheory that is employed to ground a definition of development.

One of the most popular characterizations of developmental change, at least among developmental psychologists, has been some variant of the idea that development is defined as "changes in observed behavior across age." This understanding is certainly a quick and ready pragmatic definition suitable to act as an operational guide to a series of empirical investigations. However, if this understanding were used to broadly give meaning to the domain of inquiry called developmental psychology, some very significant problems would emerge.

The first problem involves linking developmental change to age. On any close examination, it becomes clear that although age may operate fairly well at an observational level of discourse, at a reflective level it fails to make any meaningful distinctions. Age has no unique qualities that differentiate it from time; age is simply one index of time. Most important, there is nothing unique or novel about units of age-time, such as years, months, weeks, minutes, and so on. Should we then say that development is about changes that occur in time as some have (e.g., Elman, 2003), or that time is a "theoretical primitive?" Time can hardly be a theoretical anything, as time, in and of itself, does nothing. As Wohlwill (1973) once pointed out, time cannot be an independent variable, it is merely a dimension along which processes operate. All change—even if entirely transitory—occurs "in" time, so we come back to simply saying that development is about change. The implication here is that to arrive at meaningful distinctions that can direct a broad area of scientific inquiry we must explore further the nature of change itself. Before doing this, however, we shall consider a second problematic outcome of defining development as something like "changes in observed behavior across age." This is the problematic meaning of "change of observed behavior."

What Changes in Development: Expressive-Constitutive and Instrumental-Communicative Functions of Behavior

Behavior is clearly the observational focus of our empirical investigations—the dependent variable of our research efforts. The problem is whether "change in observed behavior" introduces the reflective distinction needed to articulate a broad inquiry. Observed behavior, or action more generally—at any level from the neuronal to the molar—can reflect both expressive-constitutive and instrumental-communicative functions. *Expressive* action expresses or reflects some fundamental organization or system. For example, in human ontogenesis behavior is often understood to be diagnostic of some cognitive, affective, or motivational system (see the systems described in the cubes on the left of Figure 2.2). These systems have characteristic forms of activity that are expressed as actions and patterns of action in the world (center horizontal lines of Figure 2.2). A verbalization may reflect the nature of the child's system of thought. A cry, in a particular context, may reflect the status of the child's attachment system. A series of behaviors may reflect the child's intentional system. This expressive function is *constitutive* in the sense that it en-

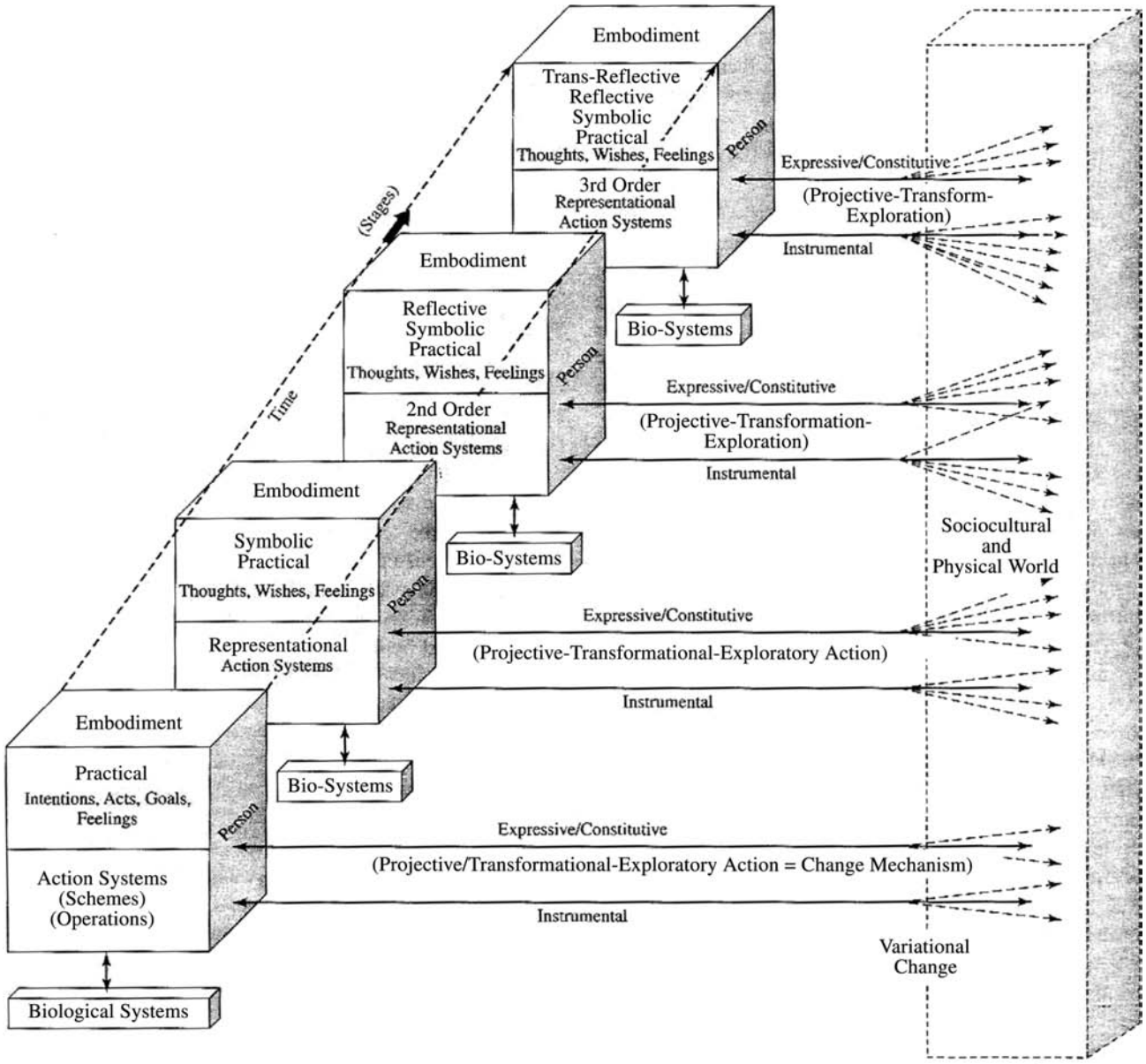


Figure 2.2 The development of the psychological subject: Levels of transformational and variational change emerging through embodied action in a sociocultural and physical world.

tails the creative function of human action (Taylor, 1995). It reflects the base from which new behaviors, intentions, and meanings are constituted. When inquiry is directed toward the assessment or diagnosis of the nature, status, or change of the underlying psychological or biological system, the expressive function is central to inquiry. When exploring the expressive function of an action, the dynamic system that is reflected in the action expression is the *what* that changes in development. Dynamic systems become transformed (left cubes of Figure 2.2) through their action (center horizontal lines of Figure 2.2). We see in the next section that dynamic systems (as a "what" of developmental change) and transformation (as a "type" of developmental change) are closely related.

Instrumental action is behavior that serves as a means to attaining some outcome; it is the pragmatic dimension of action (see center horizontal lines of Figure 2.2). For example, in human ontogenesis an expressive cognitive act or thought may also be the means to solve a problem.

An emotional act of crying may, while being expressive from one perspective, also instrumentally lead to acquiring a caregiver, and walking, which may be expressive when considered as reflecting a broad dynamic system of locomotion, may also be instrumental in acquiring nourishment. *Communicative* action extends action into the domain of the intersubjective (relation of the person cubes at the left and social world at the right of Figure 2.2). Broadly, the expressive-constitutive is the process whereby we come "to have the world we have," and the instrumental-communicative is the process whereby "we order the things in that world" (Taylor, 1995, p. ix). Expressive-constitutive and instrumental-communicative functions of action have each been the focus of developmental investigations. However, conceptual confusions arise and impact on empirical inquiry, if it is left unclear whether the focus of a specific investigation is on the expressive-constitutive or the instrumental-communicative dimension of behavior.

Consider some examples from human ontogenesis that make either expressive-constitutive functions or instrumental-communicative functions the focus of inquiry. Investigations of the infant-caregiver attachment relationship measure the proximity seeking action of the child to the caregiver. When considered as proximity seeking, the action has an instrumental character to it. However, Bowlby and his colleagues have been primarily interested in this action as an expression of an underlying attachment organization; hence, their focus is on the expressive. Bowlby and colleagues use proximity seeking as diagnostic of an underlying attachment system. Piagetian tasks such as the object permanence task, or the conservation task, when examined from an instrumental perspective, constitute successful or unsuccessful problem-solving activities. However, Piaget and his colleagues constructed and used these tasks expressively to diagnosis specific forms of cognitive organization (e.g., schemes, operations). Alternatively, while students' grade point averages may be understood as reflecting, in part, some intellectual organization, the focus of a number of social-cognitive investigations have been on the instrumental quality of this action as an adaptation or adjustment to the social-cultural context. In fact, many investigations that take a sociocultural point of view (see Pinquart and Silbereisen, 2004) limit their developmental interests to instrumental "child outcomes," "coping behaviors," and the other behaviors considered as adaptations to the cultural context. As another example, walking can be examined as an expression of a system of locomotion, but investigations may also focus on walking as instrumental to attaining a goal. Similarly, emotions may be explored as expressions of affective organization (e.g., Boesch 1984; Sroufe, 1979) or as instrumental in attaining a particular outcome (e.g., Saarni, Mumme, & Campos, 1998). Finally, although language development may be, and often has been investigated as a means of communicative functioning, it also has been alternatively examined as an expression of affective-cognitive organization (e.g., Bloom, 1998; Bloom & Tinker, 2001).

From these and other examples it becomes clear that any given action can be understood from the perspective of either its expressive-constitutive or its instrumental-communicative features. Neither the expressive-constitutive nor the instrumental-communicative are given to direct observation, both are reflective characterizations drawn and refined from commonsense understandings, and each may be a legitimate focus of inquiry. When, however, the distinction between expressive-constitutive and instrumental-communicative is not made explicit, "observed behavior" becomes ambiguous. This ambiguity fosters confusion about the specific aim of inquiry and how it contributes to our general understanding of development. Further, this ambiguity allows implicit values to seep in, eventually splitting and contextualizing the field under the influence of hidden metatheoretical assumptions. For example, consider what occurs when "observed behavior" is implicitly framed by historical behavioristic and neopositivistic values. Because early behaviorism and neopositivism excluded the idea that "organization" or "system" could be a fundamental object of inquiry (i.e., excluded the possibility that any person-centered mental systems could be included as legitimate explanations of human behavior), "observed behavior" became implicitly identified with the instrumental-communicative and *only* the instrumental-communicative.

Splitting into a dichotomy and privileging one concept over another in this example leads directly to the theory and methods wars over which concept constitutes the "legitimate" or "significant" or "meaningful" approach to empirical inquiry. For example, the classical battles between the Piagetians, Wernerians, Eriksonians on the expressive-constitutive side, and the Skinnerians, the Spence-Hull learning theorists, and social learning theorists of the Dollard and Miller school on the instrumental-communicative side represented ex-

actly this split. Each side, if not the principal figures themselves, classically assumed that its part constituted the whole. With respect to methods, the effects are more subtle or at least less explored. For example, an examination of issues of validity and reliability illustrates that validity is central to expressive interests and reliability is central to instrumental interests. The often repeated Research Methods 101 lesson, which privileges reliability with the claim that reliability concerns must be the start of measurement, is a story told by classical instrumentalists.

This example of the impact of metatheoretical assumptions represents one of three potential solutions to the relation of the expressive and the instrumental. This "nothing-but" solution takes the instrumental-communicative as privileged and marginalizes the expressive. As another example, this is the solution of any perspective that advocates an exclusively "functional" approach to a topic of inquiry (e.g., see the work on the functional theory of emotions, Saarni et al., 1998); any theory that advocates an exclusively "adaptationist" view of a domain of interest; any theory that explicitly denies or marginalizes the status of mental structures, mental organization, or biological systems as legitimate, if partial, explanations of behavior.

The second potential metatheoretical solution reverses the privileged—marginalization process. This "nothing-but" solution offers the expressive as privileged and the instrumental as the marginal. Approaches offering biological and/or mental systems as both necessary and sufficient for the explanation of behavior would be examples of this solution.

The third metatheoretical solution presents the expressive and the instrumental as co-equal complementary process that function within a relational matrix. In this third approach, expressive and the instrumental are accepted, not as dichotomous competing alternatives, but as different perspectives on the same whole (this solution is illustrated in Figure 2.2). Like the famous ambiguous figure that appears to be a vase from one line of sight and the faces of two people from another line of sight, the expressive and instrumental represent two lines of sight, not independent processes. System and adaptation, like structure and function, are separable only as analytic points of view. Focusing inquiry on the diagnosis of underlying dynamic biological and psychological systems in no way denies that behaviors have an adaptive value; focusing on adaptive value in no way denies that the behaviors originate from some dynamic system (see Overton and Ennis, in press). An interesting example of an approach that begins to promote this kind of integration is found in the in the work of Dodge and colleagues on the development of aggressive behavior. Information processing generally, and Dodge's (1986) social information processing theory specifically, are fundamentally concerned with the instrumental deployment of behaviors during real-time social and physical interactions in the world. However, Dodge and Rabiner (2004) make a very strong, explicit, and clear case for the expressive significance of "latent mental structures" in the developmental process as these impact on how the child "encodes, interprets, and responds in a variety of social situations" (p. 1005; see also Arsenio & Lemerise, 2004; Crick & Dodge, 1994).

To acknowledge both the distinction between expressive-constitutive and instrumental-communicative functions of action, and to acknowledge that they constitute two legitimate parts of a single whole, is to make an assertion of inclusivity. This acknowledgment recognizes that each function assumes a legitimate role in a unified whole of developmental inquiry and that the nature of any specific inquiry is always relative to the goals of that inquiry. From this relational perspective, issues associated with ambiguities arising from contextualizing development as "changes in observed behavior" are reduced significantly by insisting on the substitution of the phrase "changes in expressive-constitutive and instrumental-communicative features of observed behavior." This substitution does not, however, resolve the problem of exactly what kinds of change should be called developmental. For this problem, further reflection is needed on change itself.

The Nature of Developmental Change: Transformational and Variational

If developmental inquiry is to be an inclusive discipline, the issue of "developmental change" needs to be approached from as broad a perspective as possible. Perhaps, the broadest conceptualization of developmental entails the recognition and incorporation of two fundamental types of change; transformational and variational (see Figure 2.2). *Transformational change* is change in the form, organization, or structure of any system. The caterpillar transforms into the butterfly, the tadpole to the frog, water transforms into ice and gas, the seed transforms into the plant, and cells transform into the organism. All nonlinear dynamic systems, including the human psyche, undergo transformational

change. Transformational change results in the *emergence of novelty.* As forms change, they become increasingly complex. This increased complexity is a complexity of pattern rather than a linear additive complexity of elements. As a consequence, new patterns exhibit novel characteristics that cannot be reduced to (i.e., completely explained by), or predicted from, earlier components (indicated by the four system cubes on the left side of Figure 2.2). This emergence of novelty is commonly referred to as *qualitative* change in the sense that it is change that cannot be represented as purely additive. Similarly, reference to "*discontinuity*" in development is simply the recognition of emergent novelty and qualitative change (Overton & Reese, 1981). Concepts of stages, phases, or levels of development are theoretical concepts, which reference transformational change with the associated emergent novelty, qualitative change, and discontinuity. Each of the grand developmental figures of the twentieth century—Piaget, Vygotsky, Werner—acknowledged the centrality of these features of transformational development; Piaget and Werner via their ideas of development proceeding through phases of differentiation and reintegration; Vygotsky (1978) in his argument that development is not "the gradual accumulation of separate changes . . . [but] a complex dialectical process characterized by . . . qualitative transformations of one form into another [with an] intertwining of external and internal factors" (p. 73). (See also Schneirla, 1957.)

The philosopher E. Nagel (1957) articulated the broad dimensions of transformational change when he described development as entailing two fundamental features: (1) "the notion of a system, possessing a definite structure [i.e., organization] . . ." and (2) "the notion of a set of sequential changes in the system yielding relatively permanent but novel increments not only in its structures [i.e., organization] but in its modes of operation [i.e., functions] as well" (p. 17).

It is important to emphasize that transformational change references relatively enduring and irreversible changes in dynamic systems (e.g., the biological system; the psychological subject or person as a system; the cognitive, affective, and motivational systems) and changes that are sequential in nature. The enduring and irreversible characteristic of transformational change eliminates relatively transient or easily reversible changes as developmental change, while the sequential character establishes its *teleological* (goal oriented) nature. Sequence implies an order and any order is necessarily directional in character. A transformational change is one that necessarily implies a direction toward some end state or goal. Here, it is critical to recognize the metatheoretical distinction between subjective and objective teleology. Subjective teleology involves *subjectively held* "purposes," "aims," or "goals" (e.g., "I intend to become a better person") and is irrelevant to the definition of transformational developmental change. Objective teleology involves the construction of principles or rules designed to explain phenomena under investigation (e.g., "the development of x moves from lack of differentiation to more equilibrated levels of differentiation and hierarchic integration"). The rule so constructed conceptually finds, discovers, or identifies the sequential order and the end state. Any theory consists of explanations of some topic or domain and a developmental transformational theory must articulate what is developing.

It is a conceptual confusion to argue that adequate descriptions are more important than the positing of endpoints (e.g., Sugarman, 1987), or similarly to suggest a movement away from endpoints and toward "a more neutral, person-time-and-situation-geared conception of development," (Demetriou & Raftopoulos, 2004, p. 91). There is no neutral standpoint, and no description could occur without a positing of endpoints. The question is what one would possibly describe if one did not understand development as tending toward some specified end? If one wishes to describe/explain the course of acquiring language, then adult language is, of necessity, the endpoint. No description of the language of the child would be possible without this ideal endpoint. In a similar fashion, if one wishes to describe/explain the transformational development of reasoning, thought, problem solving, personality, or anything, a conceptual endpoint must serve as the ideal ultimate model.

A portion of this confusion over the positing of developmental endpoint arises from the mistaken notion that positing an ideal necessarily leads to an "adultomorphic perspective [that] forces one to view earlier behaviors and functions as immature versions of adult functions" (Marcovitch & Lewkowicz, 2004, p. 113). Central to this argument is its failure to recognize that nonlinearity (discontinuity) is characteristic of transformational developmental change. For example, Piaget's interest in examining the development of reasoning process led him to take deductive propositional reasoning as the endpoint of inquiry. However, Piaget described several quite different forms of reasoning (e.g., preoperational and

concrete operational) that function as discontinuous precursors to this adult form. It also needs to be noted that endpoints can be posited with respect to content (e.g., the adult memory model, the adult reasoning model), with respect to structure (e.g., Werner's, 1957, orthogenetic principle "development . . . proceeds from an initial state of relative globality and lack of differentiation to a state of increasing differentiation, articulation, and hierarchic integration," p. 126), and with respect to function (e.g., see Valsiner, 1998a discussion of equilibrium models; Piaget's discussions of levels of adaptation). One cannot condemn the positing of endpoints and then make claims that distal evolutionary (i.e., adaptational) determinants play a role in development (Marcovitch & Lewkowicz, 2004). Distal adaptations are endpoints.

A related conceptual confusion occurs when the concept of "maturation" is introduced into the definition of development as in "development refers to the maturation of various systems." The problems here are twofold. First, if maturation is simply understood according to its traditional dictionary meanings (i.e., "the emergence of personal and behavioral characteristics through growth processes," Merriam-Webster's Online Dictionary, Tenth Edition; "the process of becoming completely developed mentally or emotionally," Cambridge International Dictionary of English, online edition), then it is tautological with and adds nothing to the already discussed definition of transformational features of development. Second, if maturation is taken to suggest the action of biological systems, then the concept of, and potential mechanisms of development have become conflated, and this represents a serious conceptual confusion.

Embryological changes constitute some of the clearest and most concrete examples of transformational or morphological change (Edelman, 1992; Gottlieb, 1992). Through processes of differentiation and reintegration, movement occurs from the single celled zygote to the highly organized functioning systems of the 9-month fetus. Some cognitive and social-emotional phenomena of human ontogenesis have also been conceptualized as reflecting transformational change. For example, overt action may undergo a sequence of transformations to become symbolic thought, and further transformations lead to a reflective symbolic thought exhibiting novel logical characteristics (see boxes on left side of Figure 2.2). Memory may reflect transformational changes moving from recognition memory to recall memory. The sense of self and identity (Chandler, Lalonde, Sokol, & Hallett 2003; Damon & Hart, 1988; Nucci, 1996) have been portrayed by some as moving through a sequence of transformations. Emotions have been understood as differentiations from an initial relatively global affective matrix (Lewis, 1993; Sroufe, 1979). Physical changes, such as changes in locomotion, have also been conceptualized as transformational changes (Thelen & Ulrich, 1991).

Variational change refers to the degree or extent that a change varies from a standard, norm, or average (see the arrows on the right side of Figure 2.2). Take the pecking of the pigeon; changes in where, when, and how rapidly pecking occurs are variational changes. The reaching behavior of the infant, the toddler's improvements in walking precision, the growth of vocabulary, and receiving better or worse grades are all examples of variational change. From an adaptive (instrumental) point of view, developmental variational change is about a skill or ability becoming more precise and more accurate. This type of change can be represented as linear; as completely additive in nature. As a consequence, this change is understood as *quantitative* and *continuous.*

At any given level of form (i.e., any level of a dynamic system), there are quantitative and qualitative variants that constitute variational change. If thinking is understood as undergoing transformational change, then at any given transformational level, variational changes are found in variants of thought (e.g., analytic styles and synthetic styles). If emotions are presented as undergoing transformational change, then at any transformational level, variational change is reflected in differences in the degree of emotionality (more or less anxious, empathic, altruistic, and so on). If identity is thought of as undergoing transformational change, then at any transformational level, there is variational change in the type of identity assumed (i.e., individualistic or communal). If memory undergoes transformational change, there is variational change in differences in memory capacity, memory style, and memory content.

Transformational change has been identified with normative issues such as changes that are typical of phyla, species, and individuals. In ontogenesis, for example, normative changes in cognitive, affective, and motivational systems have been the central issue of concern. The focus here is sequences of universal forms whose movement defines a path or trajectory. As suggested earlier, when tracing developmental trajectories, concepts of irreversibility, discontinuity (nonadditivity,

nonlinearity), sequence, and directionality are associated with transformational change. Variational change has been identified with differential issues across and within individuals and groups. Interest has focused on local individual and group differences that suggest a particularity, and a to-and-fro movement of change. Concepts of reversibility, continuity, and cyclicity are associated with variational change. When change is considered both in terms of life forms and physical systems, transformational change is identified with what has been called the "arrow of time," and variational change is identified with the notion of the "cycles of time" (Overton, 1994a, 1994c; Valsiner, 1994).

Incorporating transformational and variational change into a broad understanding of development raises the issue of how these two forms are to be related. The same three metatheoretical solutions that have historically appeared with respect to the concept of the expressive-instrumental appear again for the transformational-variational. The first solution splits the pair, thus forming a dichotomy, and treats the instrumental as privileged bedrock. This solution marginalizes transformational change by claiming that it is mere description, which itself requires explanation. Essentially, this claim is the promise that all apparent transformational change will ultimately be explained—perhaps as our empirical knowledge increases—as the product of variation and only variation. An important consequence of this solution is that the associated metamethod will prescribe methods that can assess linear additive processes, but will marginalize methods that assess nonlinear processes. A classic example of this general solution was the Skinnerian demonstration that given only variations in pecking and reinforcement, it was possible to train pigeons to hit Ping-Pong balls back and forth over a net. Thus, it was claimed that the apparent developmental novelty of playing Ping-Pong was in reality "nothing-but" the continuous additive modifications in variation. This solution is also adopted by those who portray cognitive development as either a simple increase in representational content (see Scholnick & Cookson, 1994) or as an increase in the efficiency with which this content is processed (Siegler, 1996; Sternberg, 1984).

The second metatheoretical solution treats transformational change as the bedrock reality and marginalizes the significance of variation. Variation is seen as rather irrelevant noise in a transformational system. While this solution is seldom explicitly articulated, some stage theories such as Erik Erikson's (1968) theory of psychosocial development have elevated transformational change to a point that the importance of the variational seems to disappear below the horizon.

As described earlier, the third metatheoretical approach does not split transformation and variation into competing alternatives, but rather it understands the transformational-variational as a fundamentally necessary and real whole containing co-equal complementary processes. This solution asserts a reality in which the processes assume differentiated functional roles, but each process in itself explains and is explained by the other. Transformational systems produce variation and variation transforms the system (this solution is illustrated in Figure 2.2). This relational metatheoretical stance is described in detail later as a "take on reality" that, as suggested earlier, resolves many of developmental inquiry's most controversial problems, and opens new paths of investigation.

A Unified Concept of Development

When transformational-variational change and changes in expressive constitutive instrumental communicative action are cast into a relational matrix, they reflect complementary images of the totality of developmental change. The *expressive-constitutive* and *instrumental-communicative dimension* articulates *what* it is that changes during development. In the domain of developmental psychology, it is the *psychological subject* (or dynamic systems that explain the functioning of the subject) and the *subject's action* that become foreground. Piaget and Skinner, for example, each construct a radically different vision of the nature of the changing subject, but both focus on the subject. Piaget considers both the expressive and instrumental to each be essential features of what changes. "Schemes" and "operations" are identified as the source of the subject's expressive-constitutive action, while "procedures" are conceived as instrumental strategies designed to succeed in the actual world. For Skinner, the expressive is denied or marginalized, and "operants" represent the subject's instrumental adjustments to a changing environment.

The *transformational-variational dimension* articulates the *nature of the change* taking place. It is the *action* rather than the function of the action that becomes the foreground. Here, actions that are expressive-

instrumental in function, vary and transform. Later in the chapter, for example, the neo-Darwinian theory of evolutionary change is discussed, as is developmental systems theory. In these cases, the primary focus is on variational and transformational change of action, while the expressive-instrumental functions of the action fade to background.

Casting the dimensions of what changes, and the nature of change, as complementary lines of sight reveals that the dimensional features can be recombined depending on the goal of inquiry. For example, it is possible to form a transformational-expressive dimension. This focus explores the sequence of system changes—whether affective, emotional, physical, or cognitive system—which become reflected in sequential changes in the cognitive-affective meanings that the psychological subject projects onto her world. Similarly, the variational-instrumental dimension can be thought of as focusing inquiry on variational changes in action that result in procedures or strategies—again whether affective, emotional, physical, cognitive, and so on—which the subject employs in adjustment and adaptation.

These reflections on changes in expressive-instrumental action and transformational-variational change provide a base from which it is possible to suggest a relatively inclusive definition of development that moves beyond the ambiguities of "change in observed behavior across age" and more reasonably begins to carry the load of all of developmental inquiry. Development within this context is understood to refer to *formal (transformational) and functional (variational) changes in the expressive-constitutive and instrumental-communicative features of behavior.* Behavior is understood broadly in this definition, thus not limiting developmental inquiry to a specific field of investigation. Disciplines as diverse as history, anthropology, philosophy, sociology, evolutionary biology, neurobiology, and psychology, as well as natural science investigations of system changes all become potential forms of developmental inquiry. Developmental change within this inclusive definition includes at least—as suggested earlier—phylogenesis (i.e., the development of phyla, or evolutionary change), ontogenesis (i.e., the development of the individual), embryogenesis (i.e., the development of the embryo), microgenesis (i.e., development across short time scales, such as the development of an individual percept or individual memory), pathogenesis (i.e., the development of pathology), and orthogenesis (i.e., normal development). From this perspective, developmental inquiry necessarily becomes interdisciplinary and comparative in nature.

This inclusive relational definition of development is a starting point for further excursions both backward, into the nature and history of the metatheoretical concepts that frame the definition (and other basic features) of developmental inquiry, and forward to conceptual, theoretical, and methodological consequences of understanding development in this fashion. In gazing forward to consequences of this understanding, light is cast on a significant but often obscured conceptual feature of some of the classical developmental controversies. Consider these often debated questions: Is development universal (typical of most people, despite specific biological circumstances, culture, or social background) or particular (typical of only some people)? Is development necessarily directional or contingently directional? Is development irreversible or reversible? Is development continuous (linear; i.e., capable of being represented additively) or discontinuous (nonlinear, i.e., emergent novel forms or stages appear)? Is development fundamentally about biology or culture? Each of these questions becomes a debate only when the conceptual pair is cast as an antinomy. From an inclusive relational metatheoretical position, all such debates necessarily evaporate, as the conceptual pairs become co-equal, indissociable complementarities. Thus, for example, from the relational perpective it is possible to assert with some confidence, on both rational and empirical grounds, that while the content of memory or memory strategies, as well as the content of thinking or thinking styles, is particular (variable change), recall memory and symbolic thought are typical acquisitions of all human ontogenesis (transformational change). Similarly, there would appear to be little doubt that a raised grade point average can be reversed (variable change), but this in no way denies that the movement from babbling to language may be more profitably understood as sequential and directional and irreversible (transformational change). Reflection, as well as commonsense observation, suggests that there is some coherence to behavior and that this coherence becomes expressed (expressive) in action; yet, there is also little to deny that this activity functions in the context of a world that imposes demands on it (variable, instrumental). Reflection on several scientific disciplines, as well as commonsense observation, also suggests that in some arenas novelty emerges (transformational), while

in others arenas changes are more reasonably represented as additive (variational). And hundreds of years of failed attempts to successfully sort behavior into discrete nature piles and nurture piles should suggest that perhaps a relational approach that eliminates all "*which one* and all *how much*" questions might offer a more productive conceptual foundation for investigations into the operation of biology and culture processes in development.

Along with casting light on conceptual debates that have long framed developmental inquiry, an inclusive understanding of development has ripple effects that move out to implications for empirical methods. The most general implication is that empirical inquiry in this context abandons the aim of broad-based debunking found historically in instrumentalist approaches to science (see the later discussion of methodology). Within a relational metamethod, questions of whether stages exist (transformational change, discontinuity, sequence) or are absent (variational change, continuity) disappear. In place of these questions, inquiry that takes the transformational pole of change as its object directs itself to empirically examine the plausibility of various alternative models of stage, phase, or level change (nonlinear change). Inquiry taking variational change as its object would be explicitly recognized as irrelevant to stage issues as such, and relevant to issues such as the stability of individual differences across age, time, or stages. Such change-specific inquiry opens the door to a greater recognition of the importance of change-specific techniques of measurement. For example, investigations with the central aim of examining transformational (nonlinear) and expressive acts often call for the application of contemporary order-scaling techniques and correlational techniques to assess changes in transformational patterns, and latent traits (see, the later discussion of methodology; e.g., Bond & Fox, 2001; Fischer & Dawson, 2002; Sijtsma & Molenaar, 2002). Studies of variational change (stability, continuity), those tracing the trajectory of variational change (i.e., the developmental function), and those exploring instrumental acts typically call for traditional correlational procedures and traditional experimental procedures (see the later discussion of methodology, and, e.g., Appelbaum & McCall, 1983).

The following sections describe and examine in detail the nature of split and relational metatheories, along with an important metatheory nested within the relational. These sections also describe the impact of these metatheories on various concepts and issues in the field of developmental psychology. Following the extended discussion of split and relational metatheories, there is a section devoted to epistemological-ontological issues. There, a history of the philosophical traditions that establish the conceptual frameworks for split and relational approaches will be described along with further implications for concepts and theories of development drawn from these traditions. Finally, these traditions will serve as background for a section exploring split and relational approaches to the metamethods and methods of developmental psychology.

SPLIT AND RELATIONAL METATHEORIES

Earlier it was mentioned that the most general and abstract metatheories have traditionally been called "worldviews." In developmental psychology, the most widely discussed worldviews have been those described by Steven Pepper (1942) as the mechanistic, the contextualist, and the organismic (Ford & Lerner, 1992; Overton, 1984; Overton & Reese, 1973; Reese & Overton, 1970). The worldviews discussed here are closely related to Pepper's categorization. *Split metatheory* entails all of the basic categories described by Pepper as mechanistic, including a commitment to viewing the ultimate nature of the universe, and hence the nature of the psychological subject, as reactive, uniform, and fixed. *Relational metatheory* alternatively embraces most of the basic categories described by Pepper as contextualistic and organismic, including a commitment to understanding the ultimate nature of both universe and persons as active, organized, and changing. Relational metatheory however, departs from Pepper's skepticism about the possibility of uniting contextualism and organism, and offers what it considers to be a productive rapprochement (Overton & Ennis, in press).

Split Metatheory

Split metatheory entails several basic defining principles, including "splitting," "foundationalism," and "atomism." *Splitting*—a concept that emerged from the thinking of Rene Descartes—is the separation of components of a whole into mutually exclusive pure forms or elements. In splitting, these ostensibly pure forms are cast into an exclusive "either/or" framework that forces them to be understood as contradictions in the sense that one category *absolutely* excludes the other (i.e., follows the logical law of contradiction that it is never the case

that A = not A). But, in order to split, one must accept the twin principles of *foundationalism* and *atomism.* These are the metatheoretical axioms that there is ultimately a rock bottom unchanging nature to reality (the foundation of foundationalism), and that this rock bottom is composed of elements—pure forms—(the atoms of atomism) that preserve their identity regardless of context. A corollary principle here is the assumption that all complexity is *simple complexity* in the sense that any whole is taken to be a purely additive combination of its elements.

Splitting, foundationalism, and atomism are all principles of decomposition; breaking the aggregate down to its smallest pieces, to its bedrock (Overton, 2002). This process also goes by other names including *reductionism* and *the analytic attitude* (Overton, 2002). Split metatheory requires another principle to reassemble or recompose the whole. This is the principle of *unidirectional and linear (additive) associative or causal sequences.* The elements must be related either according to their contiguous co-occurrence in space and time, or according to simple efficient cause-effect sequences that proceed in a single direction (Bunge, 1962; Overton & Reese, 1973). Split metatheory admits no determination other than individual efficient causes or these individual causes operating in a conjunctive (i.e., additive) plurality: No truly reciprocal causality is admitted (Bunge, 1962; Overton & Reese, 1973).

All antinomies emerge from a split metatheoretical context. The individual-social or individual-collective or person-social antinomy, for example, represents all behavior and action as the additive product of elementary bedrock pure forms identified as person and sociocultural. Arising from this splitting, behavior is understood as an aggregate composed of these two pure forms, and the question becomes one of the primacy or privileged quality of one or the other. Nativism-empiricism or nature-nurture is a closely related antinomy in which the pure forms consist of, on the one hand, some basic biological form or element (e.g., DNA, genes, neurons) and, on the other hand, some basic environmental element (e.g., parents, society, culture). These examples are explored in this and following sections.

Recently, the pursuit of the person-sociocultural antinomy has been a defining characteristic of contemporary sociocultural (e.g., Cole & Wertsch, 1996; Wertsch, 1991) and social constructivist approaches (e.g., Gergen, 1994). These follow the work of Marx who pursued the broader ideas-matter antinomy, and claimed a bedrock foundational primacy for material sociocultural objects; hence, his presentation of dialectical *materialism.* Wertsch acknowledges Marx's contribution and frames his own work within the person-social antinomy by endorsing both a split interpretation of Vygotsky (i.e., "In pursuing a line of reasoning that reflected their concern with Marxist claims about the *primacy of social forces* Vygotsky and his colleagues . . . contended that many of the design features of mediational means *originated in social life,*" 1991, p. 33, emphasis added) and a split interpretation of Luria:

> As stated by Luria (1981, p. 25), "in order to explain the highly complex forms of human consciousness one must go beyond the human organism. One must seek the origins of conscious activity and 'categorical' behavior *not in* the recesses of the human brain or in the depths of the spirit, *but in* the external conditions of life. Above all, this means that one must *seek these origins in the external processes of social life,* [emphasis added] in the social and historical forms of human existence." (Wertsch, 1991, p. 34)

At times, social constructivist and sociocultural splitting becomes more subtle. Cole and Wertsch (1996) begin one article by acknowledging, on the basis of several direct Piagetian quotes, that Piaget—a traditional villain of both socioculturalist and social constructivists, who is often inaccurately accused of privileging the person—"did not deny the co-equal role of the social world in the construction of knowledge" (p. 251). However, these authors then switch the ground of the issue from the social world specifically to culture mediation entailed by the social world and argue, both in heading ("The Primacy of Cultural Mediation," p. 251) and in text, that culture is to be privileged:

> Social origins take on a special importance in Vygotsky's theories that is less symmetrical than Piaget's notion of social equilibration. . . . For Vygotsky and cultural-historical theorists more generally, the *social world does have primacy over the individual* in a very special sense. Society is the bearer of the cultural heritage. . . . (p. 353, emphasis added)

The field of behavior genetics provides a second example of an approach to inquiry that is grounded and defined within a split metatheory. The broad goal of behavior genetics, using the methods of family, twin, and adoption studies, is to partition (split) the variation in any behavioral score (e.g., a measure of personality, psychopathology, intelligence, language, cognition) into the proportion of the variation caused by foundational

genes (pure form) and the proportion caused by the foundational environment (pure form; Plomin, 1986, 1994). "Behavior genetic models use quantitative genetic theory and quasi-experimental methods to decompose phenotypic (measured) variance into genetic and environmental components of variance" (McGuire, Manke, Saudino, Reiss, Hetherington, & Plomin, 1999, p. 1285). The primary tool employed to effect this splitting is the quantitative formula, called the "heritability index" or "heritability coefficient." This index itself entails a commitment to the additive components-of-variance statistical model (including analysis of variance and all correlation based statistics), which has a basic assumption that each score is a linear function of independent elements (i.e., the score is the sum of component effects, Winer, 1962, p. 151; also see Overton & Reese, 1973). Further, it is generally assumed that the correlational patterns produced through the application of this formula are reflections of an underlying causal reality in which genes and environment primarily contribute additively to the behavior under investigation (Vreeke, 2000). Within the behavior genetic frame, the ultimate goal is to discover the specific genetic causal pathways. The idea here is to unravel and parse conjunctive pluralities of efficient causes believed—within the context of a split metatheory—to explain any behavior, and thereby arrive at an ultimate genetic bedrock of explanation. As Plomin and Rutter (1998) say with respect to the anticipated discovery of genes associated with specific behaviors:

> The finding of genes will provide the opportunity to unravel the complicated causal processes. . . . No longer will we have to focus on how much variation in the general population is genetically influenced; instead we can make the crucial transition from "black box" inferences regarding genetic influences to the observation of specific genes. (p. 1238)

Relational Metatheory

In an analysis of the historical failures of split metatheory, as well as the emptiness of its seeming rival—postmodern thought—Bruno Latour (1993) has proposed a move away from the extremes of Cartesian splits to a center or "middle kingdom" position where entities and ideas are represented not as pure forms, but as forms that flow across fuzzy boundaries. This is a movement toward what Latour terms "relationism" a metatheoretical space where foundations are groundings, not bedrocks of certainty, and analysis is about creating categories, not about cutting nature at its joints. Relational metatheory builds on Latour's proposal. It begins by clearing splitting from the field of play and in so doing it moves toward transforming antinomies into co-equal, indissociable complementarities. As splitting and foundationalism go hand in hand, removing the one also eliminates the other. Splitting involves the conceptual assumption of pure forms, but this assumption itself springs from the acceptance of the atomistic assumption that there is a fixed unchanging bedrock bottom to reality composed of elements that preserve their identity regardless of context. Thus, acceptance of atomism leads directly to the belief that the mental (ideas, mind) and the physical (matter, body) are two absolutely different natural kinds of things. And if nature were composed of such natural kinds, then it would seem reasonable to believe in the possibility of cutting nature at its joints. A relational metatheory rejects atomism and replaces it with holism as a fundamental guiding principle. Within this conceptual frame, fixed elements are replaced by contextually defined parts with the result that—as the philosopher John Searle (1992) has suggested—"the fact that a feature is mental does not imply that it is not physical; the fact that a feature is physical does not imply that it is not mental" (p. 15). Similarly, the fact that a feature is biological does not suggest that it is not cultural; the fact that a feature is cultural does not suggest that it is not biological. Building from this base of holism, relational metatheory moves to specific principles that define the relations among parts and the relations of parts to wholes. In other words relational metatheory articulates principles of analysis and synthesis necessary for any scientific inquiry, which include (a) the identity of opposites, (b) the opposites of identity, and (c) the synthesis of wholes.

Holism

Holism is the conceptual principle that the identities of objects and events derive from the relational context in which they are embedded. The whole is not an aggregate of discrete elements, but an organized and self-organizing system of parts, each part being defined by its relations to other parts and to the whole. Complexity in this context is *organized complexity* (Luhmann, 1995; von Bertalanffy, 1968a, 1968b), in that the whole or dynamic system is not decomposable into elements arranged in additive linear sequences of cause-effect relations (Overton & Reese, 1973). Nonlinear dynamics

are a defining characteristic of this type of complexity. In the context of holism, principles of splitting, foundationalism, and atomism are rejected as meaningless approaches to analysis, and fundamental antinomies are similarly rejected as false dichotomies.

The rejection of pure forms or essences found in holism has broad implications for developmental psychology. For example, as suggested in the last section, the nature-nurture debate is framed by the agenda of splitting and foundationalism. In its current split form, no one actually asserts that matter, body, brain, and genes or society, culture, and environment provide *the* cause of behavior or development: The background idea of one or the other being the privileged determinant remains the silent subtext that continues to shape discussions. The most frequently voiced claim is that behavior and development are the products of the *interactions* of nature and nurture. But interaction itself is generally conceptualized as two split-off pure entities that function *independently* in cooperative and/or competitive ways (e.g., Collins, Maccoby, Steinberg, Hetherington, & Bornstein, 2000). As a consequence, the debate simply becomes displaced to another level of discourse. At this new level, the contestants agree that behavior and development are determined by *both* nature *and* nurture, but they remain embattled over the relative merits of each entity's essential contribution. Population behavior genetics continues its focus on the classical question of *how much* each form contributes to a particular behavior. Other split approaches continue the battle over *which* of the two pure forms determines the origin and function of a specific behavior. Thus, despite overt conciliatory declarations to the contrary, the classical *which one* and *how much* questions (see Anastasi, 1958; Schneirla, 1956), continue as potent divisive frames of inquiry. However, it would be impossible to cast questions of development as issues of "nativism" and "empiricism" (Spelke & Newport, 1998) were it not for the assumption of pure forms. Rejecting atomism and embracing holism on the other hand eliminates the idea of pure forms and consequently makes any notion of natural foundational splits untenable. This destroys the scientific legitimacy of *which one* and *how much* questions in any arena of inquiry.

But the acceptance of holism does not, in itself, offer a detailed program for resolving the many fundamental antinomies that have framed developmental psychology and other fields of scientific inquiry. Such a program requires principles according to which the individual identity of each concept of a formerly dichotomous pair is maintained, while simultaneously affirming that each concept constitutes, and is constituted by, the other. For example, both nature and nurture maintain their individual identity, while it is simultaneously understood that the fact that a behavior is a product of biology does not imply that it is not equally a product of culture; conversely, the fact that a behavior is a product of culture does not imply that is not equally a product of biology. This is accomplished by considering the identity and differences as two *moments of analysis.* The first moment being based on the principle of the identity of opposites; the second being based on the principle of the opposites of identity.

The Identity of Opposites

The principle of the *identity of opposites* establishes the identity among fundamental parts of a whole by casting them not as exclusive contradictions, as in the split methodology, but as differentiated polarities (i.e., coequals) of a unified (i.e., indissociable) inclusive matrix, as a relation. As differentiations, each pole is defined recursively; each pole defines and is defined by its opposite. In this identity moment of analysis, the law of contradiction is suspended and each category contains and, in fact, *is* its opposite. Further—and centrally—as a differentiation this moment pertains to character, origin, and outcomes. The character of any contemporary behavior, for example, is 100% nature because it is 100% nurture. There is no origin to this behavior that was some other percentage—whether we climb back into the womb, back into the cell, back into the genome, or back into the DNA—nor can there be a later behavior that will be a different percentage. Similarly, any action is both expressive and instrumental, and any developmental change is both transformational and variational.

There are a number of ways of articulating this principle, but perhaps the clearest articulation is found in considering the famous ink sketch by M. C. Escher titled *Drawing Hands.* As shown in Figure 2.3, here a left and a right hand assume a relational posture according to which each is simultaneously drawing and being drawn by the other. In this relational matrix, each hand is *identical*—thus co-equal and indissociable—with the other in the sense of each drawing and each being drawn. This is a moment of analysis in which the law of contradiction (i.e., Not the case that A = not A) is relaxed and identity (i.e., A = not A) reigns. In this *identity moment of analysis,* pure forms collapse and categories flow into each

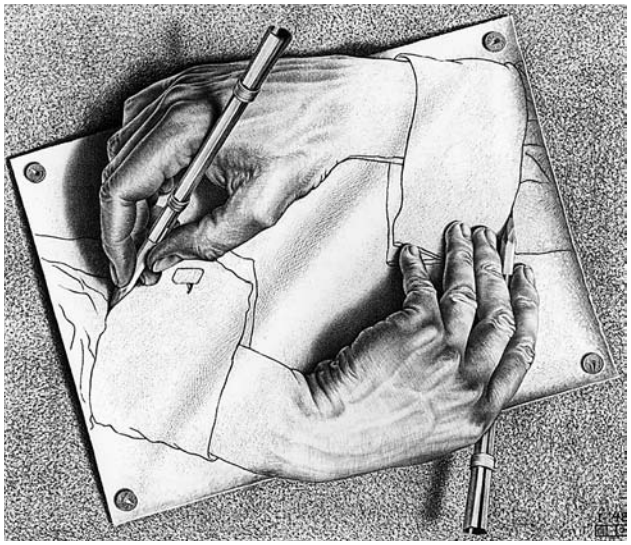


Figure 2.3 *Drawing Hands* by M. C. Escher. ©2006 The M. C. Escher Company–Holland. All rights reserved. www.mcescher.com. Used by permission.

other. Each category contains and *is* its opposite. As a consequence, there is a broad inclusivity established among categories. If we think of inclusion and exclusion as different moments that occur when we observe a reversible figure (e.g., a necker cube or the vase-women illusion), then in this identity moment we observe only inclusion. In the next (opposite) moment of analysis the figures reverse, and there we will again see exclusivity as the hands appear as opposites and complementarities.

Within this identity moment of analysis, it is a useful exercise to write on each hand one of the bipolar terms of a traditionally split antinomies (e.g., person and culture) and to explore the resulting effect. This exercise is more than merely an illustration of a familiar bi-directionality of effects suggested by many scientific investigators. The exercise makes tangible the central feature of the relational metatheory; seemingly dichotomous ideas that are often been thought of as competing alternatives can enter into inquiry as co-equal and indissociable. It also concretizes the meaning of any truly nonadditive reciprocal determination (Overton & Reese, 1973).

If inquiry concerning, for example, person, culture, and behavior is undertaken according to the principle of the identity of opposites various constraints are imposed, as with any metatheory. An important example of such a constraint is that behavior, traits, styles, and so on cannot be thought of as being decomposable into the independent and additive pure forms of person and culture. Thus, from the perspective of relational metatheory, the goals of sociocultural or social constructivist approaches in attempting to elevate society and culture to a privileged primary position is simply a conceptual confusion.

If the principle of the identity of opposites introduces constraints, it also opens possibilities. One of these is the recognition that, to paraphrase Searle (1992), the fact that a behavior is biologically or person determined does not imply that it is not socially or culturally determined, and, the fact that it is socially or culturally determined does not imply that it is not biologically or person determined. The identity of opposites establishes the metatheoretical position that genes and culture, like culture and person, and brain and person, and so on, operate in a truly *interpenetrating* manner.

Because the idea and implications of suspending the law of contradiction in some contexts and applying it in others is not a familiar one, some clarifying comments are needed. Relational metatheory, owes much to the notion of the *dialectic* as this was articulated by the nineteenth-century philosopher G. W. F. Hegel (1770–1831). For Hegel, historical—and by extension developmental—change is a dynamic expressive-transformational process of growth, represented and defined by the dialectic. Central to Hegel's dialectic is the idea of a process through which concepts or fundamental features of a dynamic system *differentiate* and move toward *integration.* Any initial concept or any basic feature of a dynamic system—called a "thesis" or an "affirmation"—contains implicit within itself an inherent *contradiction* that, through action of the system in the world, becomes differentiated into a second concept or feature—the "antithesis" or "negation" of the thesis. As a consequence, even in the single unity of thesis there is the implicit contradictory relation of thesis-antithesis, just as in the unity of the single organic cell there is the implicit differentiation into the unity of multiple cells. This points to the fundamental relational character of the dialectic.

As thesis leads to antithesis—producing the differentiation of a relational polarity of opposites—a potential space between them is generated, and this becomes the ground for the *coordination* of the two. The coordination that emerges—again through the mechanism of action of the system—constitutes a new unity or integration—called the "synthesis." The coordinating synthesis is itself a system that exhibits novel systemic properties while subsuming the original systems. Thus, a new relational dynamic matrix composed of three realms—thesis-antithesis-synthesis—is formed. The integration

that emerges from the differentiation, like all integrations, is incomplete. The synthesis represents a new dynamic action system—a new thesis. Thus, begins a new growth cycle of differentiation and integration.

In this relational scheme, the polarity of opposites (i.e., thesis and antithesis) that emerges from the initial relatively undifferentiated matrix (i.e., thesis) does not constitute cut-off (split) contradictory categories that absolutely exclude each other. Having grown from the same soil as it were, the two, while standing in a contradictory relation of opposites, also share an identity. Hegel referred to this relation as the "identity of opposites" (Stace, 1924) and illustrated it in his famous example of the master and slave. In this example, Hegel demonstrated that it is impossible to define or understand the freedom of the master without reference to the constraints of slavery; and consequently impossible to define the constraints of slavery without the reference to the freedom of the master. Freedom thus contains the idea of constraint as constraint contains the idea of freedom, and in this we see the identity of the opposites freedom and constraint.

The justification for the claim that a law of logic—for example, the law of contradiction—can reasonably both be applied and relaxed depending on the context of inquiry requires a recognition that the laws of logic themselves are not immutable and not immune to background ideas. In some metatheoretical background traditions, the laws of logic are understood as immutable realities given either by a world cut off from the human mind or by a prewired mind cut off from the world. However, in the background tradition currently under discussion the traditional laws of logic are themselves ideas that have been constructed through the reciprocal action of human minds and world. The laws of logic are simply pictures that have been drawn or stories that have been told. They may be good pictures or good stories in the sense of bringing a certain quality of order into our lives, but they are still pictures or stories, and it is possible that other pictures will serve us even better. Wittgenstein (1953/1958), whose later works focused on the importance of background or what we are calling metatheoretical ideas, made this point quite clearly when he discussed another law of logic—the law of the excluded middle—as being one possible picture of the world among many possible pictures:

> The law of the excluded middle says here: It must either look like this, or like that. So it really . . . says nothing at all, but gives us a picture. . . . . And this picture *seems* to determine what we have to do and how—but it does not do so. . . . Here saying "There is no third possibility" . . . expresses our inability to turn our eyes away from this picture: a picture which looks as if it must already contain both the problem and its solution, while all the time we *feel* that it is not so. (para. 352)

The transformation of competing alternatives into co-equal, indissociable partners is illustrated in a recent exchange of comments concerning research on the topic that social psychology refers to as the "fundamental attribution error." In this exchange, one group (Gilovich & Eibach, 2001) proceeded from a split position and noted that "human behavior is not easily parsed into situational and dispositional causes" (p. 23); they further claimed that it is difficult to establish "a precise accounting of how much a given action stems from the impinging stimulus rather than from the faculty or disposition with which it makes contact" (p. 24). The reply to this comment, from a group committed to an identity of opposites (Sabini, Siepmann, & Stein, 2001), asserts that they reject such a position because it reflects confusion between competing and complementary accounts. They argue that the problem with the question:

> How much John's going out with Sue stems from her beauty rather than from his love of beautiful women . . . is not that it is difficult to answer; it is that it is conceptually incoherent. It is incoherent because it construes two classes of accounts that are in fact complementary as if they were competing. The heart of our argument is that one must take this point seriously: All behavior is jointly a product of environmental stimuli and dispositions. (p. 43)

A similar, but somewhat more subtle, example is found in a recent dialogue on spatial development. Uttal (2000) began this dialogue with the *seemingly* complementary view that his claims about spatial development "are based on the assumption that the relation between maps and the development of spatial cognition is reciprocal in nature" (p. 247). However, in an analysis of Uttal's position, Liben (1999) raises the question of whether Utall is operating within the context of an identity of opposites, which she proposes as her own approach:

> As I read his thesis, Uttal seems to be suggesting an *independent* contribution of maps, positing that exposure to maps can play a *causal* role in leading children to develop basic spatial concepts. My own preference is to propose a

> more radically *interdependent* [emphasis added] role of organismic and environmental factors. (p. 272)

A third, more general, illustration of the power of the principle of the identity of opposites to transform competing alternatives into co-equal, indissociable partners is found in returning to the nature-nurture debate. As already suggested, within relational metatheory behavior, traits, and styles cannot be thought of being decomposable into independent and additive pure forms of genes and environment. From this perspective, the goals of behavior genetics simply represent conceptual confusion. The percentages derived from the application of heritability indices, whatever their value, can never be taken as a reflection of the separate contributions of genes and environment to individual differences because the relation of genes and environment (a left and a right Escherian hand) is not independent and additive. Moving beyond behavior genetics to the broader issue of biology and culture, conclusions such as "contemporary evidence confirms that the expression of heritable traits depends, often strongly, on experience" (Collins et al., 2000, p. 228) are brought into question for the same reason. Within a relational metatheory, such conclusions fail because they begin from the premise that there are pure forms of genetic inheritance termed "heritable traits" and within relational metatheory such a premise is unacceptable.

Within the nature-nurture debate, and in other areas, the identity of opposites also calls for a reinterpretation of the very notion of interaction. In split metatheory, "interaction" has been defined as two independent pure forms—biological and cultural—that join to produce an event. This has been called "conventional interactionism" (Oyama, 1989; see also, Lerner, 1978; Overton, 1973). In this metatheoretical context, it is possible for interaction to be understood as the cooperation or competition among elements (e.g., Collins et al., 2000) or as a quantitative situation in which one or the other element contributes more or less to a behavior (e.g., Scarr, 1992). But consider again Escher's drawings. Do the two hands contribute to the drawing and in some sense interact? They do interact, but not in an additive fashion such that contributions to drawing and being drawn could be parceled out and ascribed to one or the other hand. In the relational approach, any concept of *interaction* (e.g., interaction, co-action, transaction) must be taken to entail interpenetration; interdefinition; fusion (Tobach & Greenberg, 1984); and, most broadly, *relations.* Here independent items represent an abstraction that may prove useful for certain analytic purposes, but such abstractions in no way deny the underlying identity of opposites. The analytic and the synthetic are, themselves, two poles of a relational matrix, as are the notions of abstract and concrete (e.g., Lerner, 1978; Overton, 1973; see also Magnusson & Stattin, 1998, for an extended discussion of alternative forms of interaction).

The Opposites of Identity

While the identity of opposites sets constraints and opens possibilities, it does not in itself set a positive agenda for empirical inquiry. The limitation of the identity moment of analysis is that, in establishing a flow of categories of one into the other, a stable base for inquiry that was provided by bedrock elements of the split metatheory is eliminated. Re-establishing a stable base within relational metatheory requires moving to a second moment of analysis. This is the oppositional moment, where the figure reverses and the moment becomes dominated by exclusivity. In this opposite moment of analysis, it becomes clear that despite the earlier identity, Escher's sketch shows a *right* hand and a *left* hand. In this moment, the law of contradiction (i.e., Not the case that A = not A) is reasserted and categories again exclude each other. As a consequence of this exclusion, parts exhibit *unique* identities that differentiate each from the other. These unique differential qualities are stable within any general dynamic system and may form relatively stable platforms for empirical inquiry. The platforms created according to the principle of the opposites of identity become *standpoints, points of view, or lines of sight,* in recognition that they do not reflect absolute foundations (Harding, 1986). They may also be considered under the common rubric *levels of analysis,* when these are not understood as bedrock foundations. Again, considering Escher's sketch, when left as left and right as right are the focus of attention, it then becomes quite clear that—were they large enough—one could stand on either hand and examine the structures and functions of that hand. Returning to the nature-nurture example, while explicitly recognizing that any behavior is 100% biology and 100% culture, alternative points of view permit the scientist to analyze the behavior from a *biological* or a *cultural standpoint.* Biology and culture no longer constitute competing alternative explanations; rather, they are two points of view on an object of inquiry that has been both created by, and will only be fully understood through multiple viewpoints.

To state this more generally, the unity that constitutes human identity and human development becomes discovered only in the diversity of multiple interrelated lines of sight.

The Synthesis of Wholes

Engaging fundamental bipolar concepts as relatively stable standpoints opens the way, and takes an important first step, toward establishing a broad stable base for empirical inquiry within a relational metatheory. However, this solution is incomplete as it omits a key relational component, the relation of parts to the whole. The oppositional quality of the bipolar pairs reminds us that their contradictory nature still remains, and still requires a resolution. Further, the resolution of this tension cannot be found in the split approach of reduction to a bedrock reality. Rather, the relational approach to a resolution is to move away from the extremes to the center and above the conflict, and to here discover a novel system that will coordinate the two conflicting systems. This is the principle of the synthesis of wholes, and this synthesis itself will constitute another standpoint.

At this point, the Escher sketch fails as a graphic representation. While *Drawing Hands* illustrates the identities and the opposites, and while it shows a middle space between the two, it does not describe a coordination. The synthesis for this sketch is an unseen hand that has drawn the drawing hands and is being drawn by these hands. The synthesis of interest for the general metatheory would be a system that is a coordination of the most universal bipolarity imaginable. Undoubtedly, there are several candidates for this level of generality, but the polarity between *matter or nature,* on the one hand, and *society,* on the other, seems sufficient for present purposes (Latour, 1993). Matter and society represent systems that stand in an identity of opposites. To say that an object is a social object in no way denies that it is matter; to say that an object is matter in no way denies that it is social. The object can be analyzed from either a social or a physical standpoint, and the question for synthesis becomes the question of what system will coordinate these two systems. Arguably, the answer is that it is *life* or living systems that coordinate matter and society. Because our specific focus of inquiry is the psychological, we can reframe this matter-society polarity back into our nature-nurture polarity of *biology* and *culture.* In the context of psychology then, as an illustration, write "biology" on one and "culture" on the other Escher hand, and what system coordinates these systems?—the human organism, the *person* (see Figure 2.4a). Persons—as integrated self-organizing dynamic system of cognitive, emotional, and motivational processes and the actions this system expresses—represent a novel level or stage of structure and functioning that emerges from, and constitutes a coordination of, biology and culture (see Magnusson & Stattin, 1998, for an analysis of a methodological focus on the person).

At the synthesis then, there is a standpoint that coordinates and resolves the tension between the other two members of the relation. This provides a particularly broad and stable base for launching empirical inquiry. A *person standpoint* opens the way for the empirical investigation of universal dimensions of psychological structure-function relations (e.g., processes of perception, thought, emotions, values), their individual differences, and their development across the life span. Because universal and particular are themselves relational concepts, no question can arise here about whether the focus on universal processes excludes the particular, it clearly doesn't as we already know from the earlier discussion of polarities. A process viewed from a universal standpoint in no way suggests that it is not contextualized. The general theories of Jean Piaget (1952), Heinz Werner (1940/1957), James Mark Baldwin (1895), William Stern (1938), and Erik Erikson (1968); the attachment theory and object relations theories of John Bowlby (1958); Harry Stack Sullivan (1953); and Donald Winnicott (1965, 1971) all are examples of developmentally oriented relational person standpoints.

It is important to recognize that one standpoint of synthesis is relative to other synthesis standpoints. Life and society are coordinated by matter, and thus, within psychological inquiry, *biology* represents a *standpoint* as the synthesis of *person and culture* (Figure 2.4b). The implication of this is that a relational biological approach to psychological processes investigates the biological conditions and settings of psychological

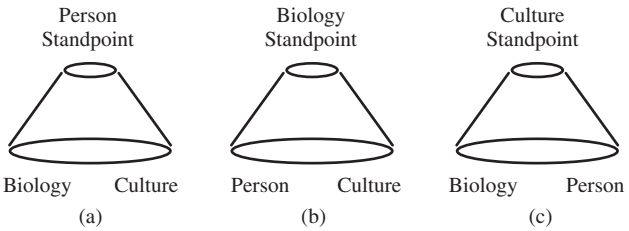


Figure 2.4 Relational standpoints in psychological inquiry: (a) person, (b) biology, and (c) culture.

structure-function relations and the behaviors they express. This exploration is quite different from split—foundationalist approaches to biological inquiry that assume an atomistic and reductionistic stance toward the object of study. The neurobiologist Antonio Damasio's (1994, 1999) work on the brain-body basis of a psychological self and emotions is an excellent illustration of this biological relational standpoint. And in the context of his biological investigations Damasio (1994) points out:

> A task that faces neuroscientists today is to consider the neurobiology supporting adaptive supraregulations [e.g., the psychological subjective experience of self]. . . . I am not attempting to reduce social phenomena to biological phenomena, but rather to discuss the powerful connection between them (p. 124). . . . Realizing that there are biological mechanisms behind the most sublime human behavior does not imply a simplistic reduction to the nuts and bolts of neurobiology. (p. 125)

A similar illustration comes from the Nobel laureate neurobiologist Gerald Edelman's (1992; Edelman & Tononi, 2000) work on the brain-body base of consciousness:

> I hope to show that the kind of reductionism that doomed the thinkers of the Enlightenment is confuted by evidence that has emerged both from modern neuroscience and from modern physics. . . . To reduce a theory of an individual's behavior to a theory of molecular interactions is simply silly, a point made clear when one considers how many different levels of physical, biological, and social interactions must be put into place before higher order consciousness emerges. (Edelman, 1992, p. 166)

A third synthesis standpoint recognizes that life and matter are coordinated by society, and again granting that the psychological inquiry is about psychological processes, *culture* represents a standpoint as the synthesis of *person* and *biology* (Figure 2.4c). Thus, a relational cultural approach to psychological processes explores the cultural conditions and settings of psychological structure-function relations. From this *cultural standpoint* the focus is upon cultural differences in the context of psychological functions as complementary to the person standpoint's focus on psychological functions in the context of cultural differences.

This standpoint is illustrated by "cultural psychology," or "developmentally oriented cultural psychology." However, not all cultural psychologies emerge from relational metatheory: For example, when a cultural psychology makes the social constructivist assertion that social discourse is "prior to and constitutive of the world" (Miller, 1996, p. 99), it becomes clear that this form of cultural psychology has been framed by split foundationalist background ideas. Similarly, when sociocultural claims are made about the "primacy of social forces," or claims arise suggesting that "mediational means" (i.e., instrumental-communicative acts) constitute the *necessary* focus of psychological interest (see, e.g., Wertsch, 1991), the shadow of split foundationalist metatheoretical principles are clearly in evidence.

A recent example of a relational developmentally oriented *cultural standpoint* emerges in the work of Valsiner (1998b), which examines the "social nature of human psychology." Focusing on the social nature of the person, Valsiner stresses the importance of avoiding the temptation of trying to reduce person processes to social processes. To this end, he explicitly distinguishes between the "dualisms" of split foundationalist metatheory and "dualities" of the relational stance he advocates. Ernst Boesch (1991) and Lutz Eckensberger (1990, 1996) have also presented an elaboration of the relational cultural standpoint. Boesch's cultural psychology and Eckensberger's theoretical and empirical extensions of this draw from Piaget's cognitive theory, from Janet's dynamic theory, and from Kurt Lewin's social field-theory and argues that "cultural psychology aims at an integration of individual and cultural change, an integration of individual and collective meanings, a bridging of the gap between subject and object" (e.g., Boesch, 1991, p. 183).

In a similar vein, Damon (1988) offers a vision of the cultural standpoint in his discussion of "two complementary developmental functions, . . . the social and the personality functions of social development" (p. 3). These are presented by Damon as an identity of opposites. The social function is an act of integration serving to "establish and maintain relations with other, to become an accepted member of society-at-large, to regulate one's behavior according to society's codes and standards" (p. 3). The personality function is the function of individuation; an act of differentiation serving the formation of the individual's personal identity that requires "distinguishing oneself from others, determining one's own unique direction in life, and finding within the social network a position uniquely tailored to one's own particular nature, needs, and aspirations" (p. 3). Although others could also be mentioned as illustrative (e.g., Grotevant, 1998; Hobson, 2002), it should be noted in conclusion here that Erik Erikson (1968), was operat-

ing from exactly such a relational line of sight when he described identity as "a process 'located' *in the core of the individual* and yet also *in the core of his communal culture*" (p. 22).

As a final point, concerning syntheses and the view from the center, it needs to be recognized that a relational metatheory is not limited to three syntheses. For example, *discourse or semiotics* may also be taken as a synthesis of *person* and *culture* (Latour, 1993). In this case, biology and person are conflated and the biological/person and culture represents the opposites of identity that are coordinated by discourse.

In summary to this point, the argument has been made that metatheoretical principles form the ground out of which grow the concepts and methods of any domain of empirical inquiry. Split metatheory produces dichotomous understandings of the world and methods that rely exclusively on the analytic ideal of the reduction of psychological process and behaviors to fixed elements, followed by the additive linear causal recomposition of elements. Split metatheory has led to the creation of a broad array of antinomies that constrict empirical inquiry. Relational metatheory heals these splits by generating inclusive holistic understandings of the world, and methods that are inherently analytic-synthetic. The relational framework promotes a truly multidisciplinary, multimethod approach to inquiry in which each individual approach is valued not as a potentially privileged vantage point, but as a necessary line of sight on the whole.

Relational metatheory grounds the unified definition of development discussed earlier, and offers methods for unraveling many conceptual knots that impact on our exploration of developmental change. However, the abstract nature of relational metatheory requires that other isomorphic metatheories mediate between this level and the more circumscribed levels of both theory and empirical observation. Again, the notion of levels of analyses and levels of metatheory become critical to a full understanding of the impact of basic concepts on empirical inquiry. Currently, *developmental systems* constitutes the best example of a metatheory that is nested within relational metatheory. Developmental systems (Gottlieb, Wahlsten, & Lickliter, 1998; Lerner, 2002; Overton, 2003; Oyama, 2000), takes seriously the centrality of holism, activity, organization, change, and nonlinearity. This approach specifically conceptualizes the individual organism as an active self-organizing systems that develops through the co-action or transaction of individual parts—initially genes-environment—in a manner that is often nonlinear in nature. The nonlinear character of this growth means that as the system transforms, novel features and novel levels of functioning emerge, and these cannot be reduced to (i.e., completely explained by) earlier features. Thus, the genetic-environmental system transforms through action into the cellular-environmental system, and then into the organ-environmental system, and ultimately the person-environmental system. Further transformations of the person-environment system result in developmental changes in cognitive, affective, and motivational subsystems. Variants of the developmental systems metatheory are found in perspectives described by Thelen and Smith (1998) as "dynamic systems"; by Magnusson and Stattin (1998) as a "holistic person" approach; and by Wapner and Demick (1998) as a "holistic, developmental, systems-oriented" approach. Developmental systems metatheory operates close to the level of theory itself and sometimes merges with specifically theoretical concepts.

In a later section, an important metatheory that operates at a midlevel between relational metatheory and developmental system is described. This interrelated set of concepts is termed developmentally oriented embodied action metatheory. It functions to extend relational metatheory and further grounds several important developmental and developmentally relevant concepts including the nature and function of the systems and subsystems that become the central domain of developmental analysis. Before turning to this description, the next section examines development and evolution as these concepts are expressed in relational and split metatheories.

DEVELOPMENT AND EVOLUTION: RELATIONAL HISTORY AND RELATIONAL MODELS

Development and evolution have been indissociable complementary concepts throughout the history of developmental psychology. As Broughton (1981) pointed out, it was the American developmental psychology pioneer James Mark Baldwin "who first attempted a synthesis of philosophy and the life sciences through a description of progressive stage by stage intellectual development (Baldwin, 1897/1973) and its continuities and discontinuities with biological organization and adaptation (Baldwin, 1902/1976)" (p. 396). Baldwin's

concern with the complementarity of evolution and individual development led him to explorations of the relation between the genome and the phenotype, and specifically questions concerning how individual adaptations during the course of ontogenesis might impact on species evolution (1902/1976). An important outcome of this work was the proposal of a process termed "organic selection" (1895) and known later as the "Baldwin effect" (see Piaget, 1967/1971, 1974/1980; see also Cairns, Chapter 3, this *Handbook,* this volume), which offered a non-Lamarckian alternative to Darwin's split mechanistic process of natural selection. Broadly, organic selection refers to the possibility of a phenotypic adaptation coming to be replaced by a genetic mutation. Such a replacement runs counter to the classical Darwinian and neo-Darwinian gene centered position that the sole function of the environment is to select from what the genome provides.

In Europe, the work of another founder of developmental psychology, William Stern (1938), also presented a framework for a developmental psychology in which evolutionary and individual developmental processes were tightly interwoven: "In the concept of development lies not merely a bare sequence of states and phases, but *evolution*; preparation, germination, growth, maturation, and recession as a meaningful process that is by nature of an organized kind" (p. 30). Heinz Werner later carried this framework to North America in his *Comparative Psychology of Mental Development* (1940/1948). Here, and in other works, Werner articulated the complementarity of evolution and development through an insistence that developmental psychology entails a *comparative* approach to formal similarities as well as material and formal differences among ontogenetic, phylogenetic and other change sequences, as follows:

> Such a developmental approach rests on one basic *assumption,* namely, that wherever there is life there is growth and development, that is, formation in terms of systematic, orderly sequence. This basic *assumption,* then entails the view that a developmental conceptualization is applicable to the various areas of life science. . . . Developmental psychology does not restrict itself either to ontogenesis or phylogenesis. . . . (1957, p. 125)

Of all the developmentalists, who have articulated and emphasized the basic complementarity of individual development and evolution, it was Jean Piaget who most extensively explored this relation. Piaget's work is best known for its person-centered approach to conceptual development from infancy through adolescence. However, when Piaget turned his attention to process explanations of this and other forms of development he moved to a broad based epigenetic stance and there explored fundamental biological × psychological × environmental interactions. It was in this context that he produced two major works (1967/1971, 1974/1980) that grappled both empirically and conceptually with the genotype-phenotype relation. Based on his own empirical studies with the common snail, *Limnaea stagnalis,* Piaget, like Baldwin, became convinced of the inadequacy of the neo-Darwinian gene dominated explanation according to which a random (genetic) variation and natural (environmental) selection process is presumed to account for adaptations that occur both intra- and intergenerationally across the course of organic life. He similarly became convinced that a Lamarckian solution in which phenotypic adaptations come to have a direct impact on the genome was equally untenable. In place of both of these, Piaget eventually (1967/1971, 1974/1980) proposed a model of the "phenocopy." This model describes a mechanism whereby individual phenotypic adaptations indirectly impact the genome and ensure intergenerational transmission of some behavioral characteristics The model builds upon Piaget's own general conceptualization of the "equilibration" process, found in his writings on ontogenetic development, and on Baldwin's notion of organic selection.

The model of the phenocopy begins with a recognition that individual development includes the several levels of organization described earlier, as each interacts (i.e., interpenetrates) with its environment (i.e., levels of DNA, protein production, cell formation, tissue growth, organ formation, the organism as a whole, the organization of behavior, and ultimately, in the case of human development, affect, motivation, and cognition). The dynamic organized systems of behavior present at birth are not the direct reflection of some split-off biologically determined innate mechanism, but the product of an epigenetic process that grows these levels across the period of prenatal development. The model accepts Baldwin's notion of organic selection with respect to this ascending series. Variational products of lower (earlier) levels may be selected according to modifications produced at higher levels. For example, "the extremely complex internal processes of the germ

cell . . . may effectively allow, prevent, or modify the transmission of mutations arising within the DNA" (Piaget, 1974/1980, p. 51).

Piaget's unique contribution lies in the further relationally based proposal that, along with this ascending effect, there is a descending one in which a disequilibrium at higher levels may, in certain situations, cause disequilibrium at lower ones ultimately resulting in a genomic copy of the phenotype or "phenocopy." The preadapted action systems available at birth function in an environment that presents conflicts and obstacles, and the impact of these obstacles represents a system disequilibrium. Importantly, these environmental obstacles do not constitute a specific message sent back to the system; this would be the beginning of a Lamarckian solution. Rather, the sole function of disequilibrium is to feed back to the system that something has gone wrong and, thus, to set in motion reequilibration processes, which are represented as variational exploratory activity. Exploratory activity constitutes phenotypic variations and in many cases the adaptation that results from this variation has no generalized impact on the biosystem (e.g., the French have been speaking French for more than a thousand years, but there have been no suggestions that French is genetically transmitted). However, the disequilibrium may impact on lower levels of organization and cause further disequilibrium all the way down to the genomic level. The response to this descending disequilibrium will produce variational exploratory activity at each level impacted. If the disequilibrium reaches to the genomic level, the variants selected will ultimately represent a genetic copy of the phenotype.

In presenting the phenocopy model, Piaget (1974/1980) explicitly acknowledged the close connection between his own work on equilibration and modern theories of self-organizing systems (i.e., dynamic systems that resist disorder and transform random process into ordered structures; p. 110). It is not surprising that others operating from a contemporary developmental systems perspective have continued to argue for a relational reciprocity of development and evolution (e.g., Ingold, 2000; Oyama, 2000) and have continued to explore the genotype-phenotype developmental relation. Recently, Gottlieb (2002), after reviewing the selective breeding and early experience literature, proposed a three-stage model for the developmental-behavioral initiation of evolutionary change that is highly consistent with Piaget's. The first stage of Gottlieb's model entails changes in ontogenetic development (novel behavioral adaptations) occurring across generations and encouraging new environmental relations. In the second stage, which may or may not entail changes in structural genes, the new environmental relations evoke latent anatomical or physiological change, and in the final stage genetic changes occur. As Gottlieb (2002) points out, "It is important to observe that, in this theory, evolution has already occurred phenotypically at the behavioral, anatomical, and physiological levels before the third stage is reached. Hence, new variations and adaptations arise before they are selected for and are therefore not a consequence of natural selection" (p. 217).

In summary, from its origins and continuing in the work of various developmental systems approaches, developmental psychology has operated within a relational frame with respect to the conceptualization of development and evolution as a reciprocal complementarity. However, beginning in the 1990s with the emergence of so-called evolutionary psychology (Buss, 1999; Tooby & Cosmides, 1992) and later evolutionary developmental psychology (Bjorklund & Pellegrini, 2002) this complementarity was fractured by a split-off conceptualization that embraces a genetic determinism and an additive concept of interaction. In this split account, genetic programs established across the course of evolution determine behavioral variation, while culture selects the individual variants that constitute individual developmental adaptations. This split perspective on evolution and development arose out of earlier ethological and sociobiological approaches, but its fundamental concepts are grounded in neo-Darwinian metatheory. There have been a number of excellent critiques of the conceptual problems raised by nonrelational accounts of evolutionary and developmental evolutionary psychology (e.g., Lickliter & Honeycutt, 2003; Mameili & Bateson, in press; Rose & Rose, 2000). We now focus on the way that split neo-Darwinian metatheory comes to impact these and other areas of traditional developmental interest.

DEVELOPMENT AND EVOLUTION: SPLIT APPROACHES

Neo-Darwinian metatheory has been variously termed the *neo-Darwinian synthesis* and *the modern synthesis.* It emerged in the 1940s based on a marriage of the evolutionary position of Darwin, called classical Darwinism, and the genetics of Mendel. There is some irony to

the use of the term "modern" as the approach is now some 60 years old. It is well known that the core of the synthesis is the duality of *random variation* and *natural selection.* From the beginning, both for Mendel with respect to genetics and for Darwin with evolution, there was a rigid separation (i.e., split) between the *internal* and the *external.* For evolutionists, the statement: "Mutations are random with respect to their environment" meant that the processes that accounted for the variation between individuals were independent of the evolutionary process that selects individuals. For geneticists, the genotype constituted the internal state of the organism, and the phenotype constituted the outside or outward manifestation (see Figure 2.5).

Along with the split between inner and outer, the most important feature of the neo-Darwinian synthesis is that evolutionary *change* is defined in terms of variation in gene frequencies and *only* variation in gene frequencies. Thus, the metatheory establishes that *change is understood as variation, not transformation.* Transformational change is essentially written out of the story and treated as epiphenomenal. Within the metatheory, genes (or DNA, to be more precise) cause phenotypes by "supplying information," "instructions," or "programs." Genes themselves are thought of as packages of independent causes, or gene pools that exert their influence in a one-way outward causal flow of direction. This independent causal aggregate and the transmission of causes from this aggregate then results in the outward manifestation called the phenotype.

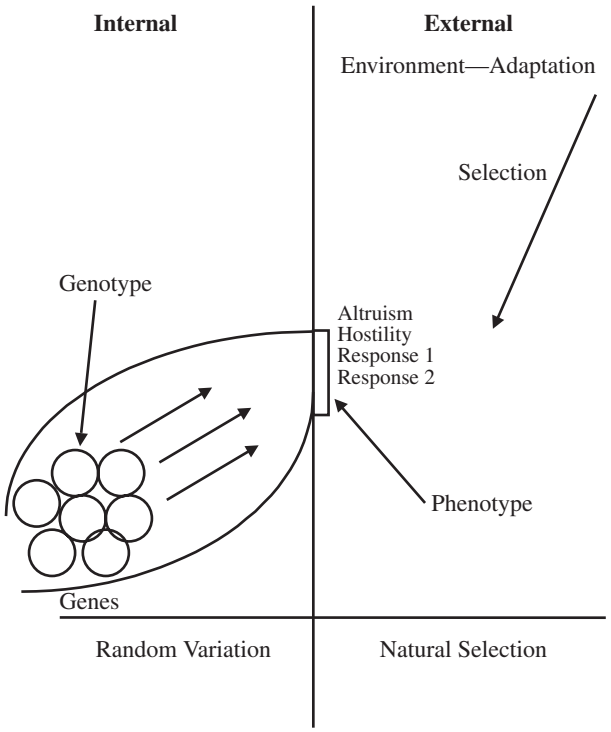


Figure 2.5 The split neo-Darwinian metatheory.

This metatheory has come to acquire a number of metaphors that support and enhance interpretations of split-off entities, fragments, aggregates, and linear unidirectional causality (see Nijhout, 1990; Oyama, 1989). Metaphors include the "bean bag" concept of the genome as independent packages, the notion that "instructions are transmitted," and the idea of a "program," "blueprint," or "instructions."

The *internal* aggregate produces random variation, but it is the *external* natural selection that determines the appearance of change. The *phenotype* constitutes the observed variability of behavior. The environment operates upon this variability as an *independent causal agent* to select those characteristics that promote survival. Two points need emphasis about this dualistic (i.e., split internal and external) understanding of causes. First, we have here the prototype for biological causes (internal) and social-cultural causes (external) as split, independent forces. Causality remains linear (additive) and unidirectional in the split model. When we tell the inside story, there is no reciprocal causation; causes simply operate independently and in a single direction, from internal toward external. The outside story replicates this; there is no reciprocal causation and the direction is now external toward internal.

The second point to note about the dualistic narrative of evolution as variation is the manner in which the concept of "adaptation" becomes formulated and established as a central feature of the external story (Gould, 1986; Lewontin, 2000). Adaptation is identified with "adjustment" and consequently refers to a *change designed to fit an independent context. Context* (i.e., social-cultural factors) selects those characteristics that best fit; hence, the central notion of competition and survival of the fittest.

In summary, the evolutionary metatheory described by the neo-Darwinian synthesis involves an internal aggregate gene pool that presents a package of solutions and an external environment that presents various problems to be solved (see Lewontin, 2000). This "adaptationist" program splits subject (genes) and object (environment) into isolated bits of reality and assigns chance variation to the former and contingent selection to the latter. The overall process is entirely contingent.

All elements—inside and outside—are fundamentally interchangeable, and any outcome could have been otherwise had other elements randomly appeared. At no point does any fundamental principle of organization enter the process; hence, all change is, in principle, reversible (Overton, 1994a).

There are many possible applications of this split neo-Darwinian metatheory to issues of developmental change. Those described below are selected to illustrate the breadth and depth to which this form of thinking has impacted on developmental issues, theory, concepts, and methodology.

Split Neo-Darwinian Metatheory: Developmental Applications

The first example of the impact of this split evolutionary metatheory, on developmental understanding is the famous/infamous nature-nurture issue. Although the neo-Darwinian metatheory did not generate the nature-nurture controversy (that had more to do with the original great splitters, Galileo and Descartes, who are discussed in a later section), it supports its continuance and limits "solutions" to attempts to put nature pieces and nurture pieces back together. The controversy is supported by the neo-Darwinian radical rupture of the whole into an inside (gene, biology) story that comes to be called nature, and an outside (social-cultural, experience) story called nurture. Once this split is confirmed as ontologically real, behaviors or characteristics (e.g., altruism, aggression, empathy, thinking, language) are explained as the causal outcome of one or the other, or some additive combination of the two. The controversy becomes the questions of *which one* fundamentally determines change, or *how much* does each contribute independently to determining change, or *how* does each contribute to determining change (Anastasi, 1958; Lerner, 1978; Overton, 1973).

The "solution" to the nature-nurture issue under this split metatheory requires choosing among several strategies designed to deal with combining and/or suppressing *independent pieces.* First, included among these strategies is *biological determinism,* which treats the outside story as epiphenomenal, and argues that the fundamental causes of behavior are given by the inside story. For example, this strategy argues that the capacity for violence is given by the genes (the real cause) and social-cultural events simply trigger the underlying biological capacity. *Social determinism,* the mirror image of biological determinism, is the strategy of treating the inside story as epiphenomenal, while arguing that the outside story provides the fundamental causes of behavior. The claim here is that there is sufficient genetic variability for either violence or gentleness, and social-cultural factors are the real cause of violent behavior. Both strategies usually decry the idea of dualism, but they deal with the dualism by suppressing the functional reality of one or the other sides of the neo-Darwinian narrative.

A third split nature-nurture strategy has been called *conventional interactionism* (Oyama, 1989; see also, Lerner, 1978; Overton, 1973). Dualism, although clearly a functional part of the scheme, is ignored by this strategy, and it is insisted that any characteristic is partially the effect of each factor. This strategy sometimes places the duality on a continuum and argues that various characteristics are more or less determined by one or the other factor (e.g., see Scarr, 1992). This is the quantitative additive compromise that was mentioned earlier with respect to split issues generally. In the final strategy, *bio/social interactionism,* dualism is *celebrated.* Generally, this approach makes claims that the biological sets the limits, or establishes "predispositions," or "constraints" for behavior and the social-cultural determines behavioral expression. This compromise is the most direct reflection of the neo-Darwinian metatheory of the nature of change (e.g., Karmiloff-Smith, 1991).

These four nature-nurture strategies do not exhaust the list of possible "solutions," nor are they necessarily mutually exclusive. Each tends at times to merge into another. However, neither the complexities of nature-nurture nor even the details of alternative nonsplit solutions are central here (see Overton, 2004a, for an extended discussion). Rather, the central point of emphasis is that the whole class of traditional solution strategies emerges because and *only* because of the acceptance of a particular metatheoretical story about the nature of things. This is the story in which "nature" (genetics, biology) is identified with an ontologically real *inside* called *nurture* that is radically split from an ontologically real *outside* called "nurture" (experience, social-cultural). If this conceptual distinction is rejected as an ontological description of "the Real," the controversies themselves evaporate.

A second example of the use of the neo-Darwinian metatheory as a template for understanding developmental phenomena emerges from the behaviorist literature. In this arena, several have noted (Oyama, 1989;

Skinner, 1984; Smith, 1986, 1990) that Skinner's model represented a direct application of the neo-Darwinian story. Skinner's operants had to originate from somewhere, but Skinner's behavioristic outside story of the subject (instrumental as opposed to expressive function of behavior) never required an articulation or elaboration on these internal origins. All that was required was the output of the inside neo-Darwinian story; the random variation of a set of operant (instrumental) responses. Given this base, Skinner's outside story can and does focus on natural selection or "selection by consequences" as presenting "the real" functional variables in the development of behavior.

More central to contemporary developmental psychological interests than Skinner's position is the work of Belsky, Steinberg, and Draper (1991), who used the neo-Darwinian metaphor as a frame for a developmental theory of socialization. Their strategy for explaining socialization has been to wed a social-biological approach to Bronfenbrenner's (1979) behavioral ecology. *Sociobiology* asserts the adaptationist strategic claim that natural selection favors behavioral strategies that increase fitness. Sociobiology also provides the authors with an inside story biologically grounded in "the modern view of evolution" (p. 663; i.e., the 1940s "modern" synthesis or neo-Darwinian synthesis). *Behavioral ecology,* alternatively, represents the outside story; the argument that behavior strategies are "contextually conditioned," shaped, or selected by the environment. "From sociobiology we take the maxim that natural selection tends to favor behavior that increases fitness. From *behavioral ecologists* we take the maxim that behavioral strategies that contribute to reproductive success are . . . contextually conditioned" (p. 648). And, "central to our theory is the notion drawn from modern evolutionary biology that humans . . . adjust their life histories in response to contextual conditions in a manner that will enhance reproductive fitness—or at least would have in the environment of evolutionary adaptation" (p. 663). The issue here does not entail the critique of this approach at either a theoretical or an observational level of discourse. The issue here concerns a recognition that this approach arises from a particular metatheory, and the consequences of accepting this metatheory, are different from those that follow from accepting another metatheory. This metatheory fosters split theoretical and observational understandings of the nature of developmental change and its explanation. The consequence of this split story is that only variability is allowed as fundamentally real developmental change, and explanation can occur only within the categories of "biological causes" and "social-cultural causes" (see Lewontin, 2000).

The investigation of mechanisms of development constitutes another important contemporary example of the neo-Darwinian metatheory of variational change and internal-external causes being applied to conceptually contextualize an important developmental psychological issue (see Hoppe-Graff, 1989; Sternberg, 1984 for a general discussions of developmental mechanisms). Siegler (1989, 1996; Siegler & Munakata, 1993) presented a scheme that represents hypothesized mechanisms of cognitive development as being analogous to several genes. Each mechanism produces alternative types (random selection), and the environment selects (natural selection) these types according to fitness criteria (see Figure 2.6).

For Siegler (1989), a mechanism of cognitive development is any "mental process that improves children's ability to process information" (p 353). This means that the developmental outcome (effect) of any mechanism

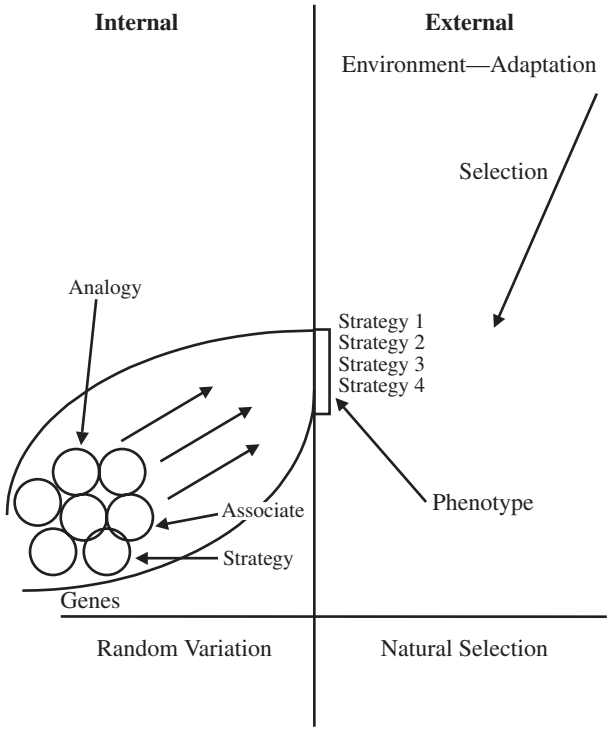


Figure 2.6 The neo-Darwinian metatheory and mechanisms of development (variational change).

(cause) is improvement in stored knowledge. Improvement here refers either to increases in amount of knowledge stored or to the effectiveness of the machinery that stores and accesses the knowledge. Thus, ultimately, development is defined in terms of stored knowledge. This in itself limits developmental change to variational change; there is no room here for transformational change as a fundamental type of change. To account for the change in stored knowledge, Siegler proposes five broadly conceived "mechanisms" of development: (1) synaptogenesis (a member of the broader class of neural mechanisms), (2) associative competition, (3) encoding, (4) analogy, and (5) strategy choice.

Each proposed developmental mechanism is understood as being analogous to an individual gene. Each is an internal packet with an outward flow of causality from genotype to phenotype. The strategy choice gene, to take one example of the five mechanisms (see Figure 2.6), causes variation in the phenotype. The result is variation in external behavior as in learning Strategy 1, Strategy 2, or Strategy 3, and so on. As a specific analogy, consider the idea of tail length in an animal. The human would have an innately prewired set of alternative strategies just as the rat would have a set of alternative genes for tail length (or technically, alleles at a particular locus).

Having presented the inside story of variational and *only* variational change, the outside story then comes into play for Siegler. The alternative strategies are conceived as being in competition for survival. The environment selects (i.e., causes) the strategy that is to survive, and that strategy is the one that best facilitates the processing of information and, hence, the building of stored knowledge. The rat might phenotypically appear with a tail length of 1″, 2″, or 3″ depending on which had been selected; individual children might come with Strategy 1, Strategy 2, or Strategy 3.

In summary, for Siegler, fast and effective knowledge acquisition defines human development and is explained by phenotypical behaviors, which are a result of underlying causal mechanisms that are built into the system. Considering knowledge acquisition, the phenotypical behavior, and the underlying mechanism as a totality constitutes both a description and an explanation of development. Siegler and Munakata (1993) have said: "The centrality of variation and selection within . . . change mechanisms does not seem coincidental. Multiple competing entities seem essential for adaptation to changing environments. Effective selection among the variants is essential for producing progressively more successful performance. Achieving these functions of variation and selection may be essential for any developing system" (p. 3).

In addition, Kuhn and her colleagues (D. Kuhn, Garcia-Mila, Zohar, & Andersen, 1995) have proposed a wide ranging cognitive position concerning the development of scientific reasoning that parallels Siegler's with respect to the exclusivity of variational change and adaptation. In their scheme, knowledge acquisition strategies, metacognitive competence, and metastrategic competence are presumed to be available in rudimentary forms in young children and constitute the elementary building blocks of scientific reasoning. These skills appear as intraindividual variability of behavior in problem solving, and development or change "appears as a gradual shift in the distribution of the use of a set of strategies of varying adequacy" (p. 9). White (1995), in commenting on this movement "toward an evolutionary epistemology of scientific reasoning" (p. 129) notes the striking similarity to the historical behavioral "scheme of trial-and-error learning proposed by Edward L. Thorndike (1898) at the turn of the century" (p. 134) and contrasts it with the Piagetian perspective that emphasizes the dialectic of transformational and variational change as codefining fundamental features of development (Overton, 1990):

> Instead of wide-sweeping structural changes in the logical engines available to the child, there are changes in cognitive *elements* that the child can call into play when confronted with a problematic situation. The changes are not wide sweeping. They are more local, particulate. Yet there is transfer. . . . The emergence of scientific reasoning depends on an orchestration of a number of cognitive *elements* that have to work together. *Change, as it occurs, is by no means irreversible.* (White, 1995, p. 135, emphasis added)

It needs to be emphasized again that, in the examples described, the type of change being identified as developmental follows directly from the neo-Darwinian metatheory as variational change and not transformational or morphological change. Siegler's proposed mechanisms of development, along with Kuhn's, Skinner's, the social biology/behavioral ecology, and socialization approaches, contemporary evolutionary psychology, and recent forays into developmental evolutionary psychology all describe change in which no

fundamental transformational novelty emerges. In each example, forms and the change of forms—changes in forms of thought from infancy to childhood, and to adolescence, or changes in forms of personality organization, or changes in emotional organization from global affect to differentiated specific emotions—are simply excluded from discussion or treated as epiphenomenal. In each of the neo-Darwinian generalizations, inside causes (nature) provide a variational base of behaviors, while outside causes (nurture) winnow down and shape that variation. Variation and the winnowing and shaping process constitute the definition and explanation of development within this story. Transformational or morphological change has simply been excluded from the fundamental story of development and treated as mere appearance.

Split Neo-Darwinian Metatheory: A Flawed Story of Change?

These several examples have been presented to demonstrate how split metatheory—specifically neo-Darwinian metatheory—can impact on the understanding and explanation of developmental change in various domains. Next, we turn to the question of the ultimate viability of this metatheory.

The split between variational change and transformational change that is a part of the neo-Darwinian story has created a broad paradox in the life sciences: On the one hand a significant number of psychologists have been turning to the neo-Darwinian story as a context within which to understand developmental change; on the other hand, many who work more directly in the fields of biological and evolutionary change complain that the neo-Darwinian story is outdated and deeply flawed because it fails to incorporate developmental change. More specifically, these critics argue that it is flawed because it omits the kind of developmental change defined as transformational change. These critics, from the fields of biology, evolutionary biology, evolutionary developmental biology, and anthropology include Brooks (1992; Brooks & Wiley, 1991), Edelman (1992), Gilbert (2003; Gilbert, Opitz, and Raff, 1996), Goodwin (1992), Gould (2000), Kauffman (1992, 1995), Ingold (2000), and Lewontin (2000). This same criticism has been articulated within the psychological community by a variety of developmental systems oriented investigators (e.g., Bateson, 1985; Gottlieb, 1992, Chapter 5, this *Handbook,* this volume; Kuo, 1967; Lehrman, 1970; Schneirla 1957; Tobach, 1981; Varela, Thompson, & Rosch, 1991).

These critics are not becoming anti-Darwinian or anti-evolutionary. They are simply articulating the need for modification and expansion of the neo-Darwinian story. Evolutionary biologists, developmental biologists, neurobiologists, geneticists, paleontologists, anthropologists, and psychologists speak in many different voices when they argue this point, but they uniformly agree on the following: Regardless of the level of analysis one chooses to explore, concepts of *organization, system, structure, or form—as well as the transformation of organization, system, structure, or form—must enter into a new evolutionary synthesis* in every bit as central a fashion as concepts of variation and selection enter the current narrative. Development—conceived as ordered changes in the form, organization, or structure of a system—must be directly integrated into the current narrative of variational change and selection.

Gilbert (2003), a developmental biologist, describes the origin of the exclusion of development (transformational change) from evolution:

> The developmental approach became excluded from the Modern Synthesis. . . . It was thought that population genetics could explain evolution, so morphology and development were seen to play little role in modern evolutionary theory. (p. 778)

Edelman (1992), a neurobiologist, goes on to articulate the dominant theme of most contemporary revisionist critics by arguing for the need to reintroduce the centrality of form and change of form (transformation) into an expanded neo-Darwinian narrative:

> The part of Darwin's program that needs most to be completed . . . is concerned with how animal form, tissue structure, and tissue function could have arisen from ancestors—the problem of morphologic evolution. (p. 48)

> Morphology—the shape of cells, tissues, organs, and finally the whole animal—is the largest single basis for behavior. (p. 49)

> To accomplish it [completing Darwin's program] we need to show how development (embryology) is related to evolution. We need to know how genes affect form through development. (p. 51)

Along with the criticism that there is more to the story of evolution than variational changes in gene frequencies, the revisionists argue against the interpretation of genes as independent split-off atomic entities,

and they call for a recognition that "genomic regulatory networks underlying ontogeny, exhibit powerful 'self-organized' structural and dynamical properties" (Kauffman, 1992, p. 153). As a consequence of recognizing the genome itself as a self-organizing system (i.e., an active form-changing organization), there is a call to "invent a new theory of evolution which encompasses the marriage of selection and self-organization" (Kauffman, 1992, p. 153; see also Varela et al., 1991).

Further, this group points out that evolutionary theory—as limited to random variation and natural selection—has become too sharply focused on the maintenance of diversity (i.e., focused on the reversible, and the cyclical) while ignoring the significance of the origin and developmental paths of diverse forms (i.e., the transformational, and the directional; Brooks, 1992; Lewontin, 2000).

Finally, the revisionists argue that the concept of adaptation to a split-off environment, as described by the neo-Darwinian metatheory of natural selection, severely limits understanding. They argue for a healing of the dualism of a split-off internal and external through a relational recognition that it is both the case that biological organisms construct their social-cultural world, and that the social-cultural world constructs biological organisms (Edelman, 1992; Lewontin, 2000).

Virtually all of the themes argued by contemporary evolutionary revisionists assert the need for an understanding that is relational in nature; an understanding where inside and outside, variation and transformation, biological and social-cultural as well as other fundamental splits are viewed as analytic distinctions, not ontological cuts in nature. This relational understanding yields distinctions that allow an investigator to stand at a particular line of sight and explore from that particular point of view without declaring that point of view to be "the real." An illustration of these themes in human ontogenesis is found in the contrast between the split-off adaptationist story found, for example, in Skinnerian theory and the social learning theories discussed earlier, and the relational picture of adaptation found in the work of Jean Piaget. Like Skinner (1984) and social learning theories, Piaget (1952) introduces adaptation as a fundamental and central theoretical concept. However, unlike these neo-Darwinian theorists, Piaget's concept of adaptation is always understood as the complement of a second central theoretical concept, organization. As with the modern evolutionary revisionists, Piaget stresses time and time again that *organization* (the form) and *adaptation* (the function) are two poles of the same relational matrix, two aspects of the same whole. It is neither that organization will ultimately be reduced to adaptation, nor that organization provides the variation and adaptation the selection. Novel organization emerges from processes of adaptation, but adaptation operates under the constraints of current organization. Organization and change of organization (transformational change) become the focus when inquiry is directed toward issues of emergent novelty, sequence, and irreversibility. Adaptation becomes focal as inquiry is directed toward issues of activity, process, and variation. Structure and function are not independent split-off either/or solutions to problems; structure and function, organization and activity, form and process, are alternative perspectives on the same whole.

In summary, the neo-Darwinian "modern synthesis" is a split metatheory that has consequences for developmental inquiry across a broad range of domains. As a narrative that speaks of variational change exclusively, it provides a conceptual context for, and reinforces, other narratives that would claim development is about variational change and *only* variational change, and that explanation is about biological causes and/or social-cultural causes. It is only within a relational metatheory that variation and transformation become indissociable complementarities and only within this metatheory do evolution and development return to the same complementary position.

DEVELOPMENTALLY ORIENTED EMBODIED ACTION METATHEORY

This section describes a metatheory that is consistent with relational metatheory but operates at a midlevel between relational metatheory and developmental system. This interrelated set of concepts is termed developmentally oriented embodied action metatheory. It functions to extend relational metatheory and further grounds several important developmental and developmentally relevant concepts including the nature and function of the systems and subsystems that become the central domain of developmental analysis

Embodiment

Several basic terms define a developmental oriented embodied action approach. Each term is associated with relational principles. For the moment, *embodiment* is the most central of these basic concepts, because

embodiment is a concept of synthesis that bridges and integrates biological, sociocultural, and person-centered approaches to psychological inquiry. Until recently, the trend of developmental inquiry over the past several decades had been moving toward ever increasing fragmentation of the object of study. Beginning in the early 1980s, the examination of human development aggressively promoted split and foundational approaches to inquiry, including variable oriented, discourse, modular, and domain specific inquiry. Each of these was advanced with claims that it presented the bedrock foundation from which scientific knowledge must grow. The result was that inquiry into human development was increasingly split into biologically determined, culturally determined, and bio-culturally determined behavior, innate modules of mind, situated cognitions, domain specific understandings, and communicative and instrumental functioning. What became lost in the exclusivity of these projects was the psychological subject as a vital integrated embodied center of agency and action. This is the embodied person—functioning as a self-organizing dynamic action system—expressively projecting onto the world, and instrumentally communicating with self and world, thoughts, feelings, wishes, beliefs, and desires. This is the embodied person who emerges from and transacts with the relational biological-cultural world, thereby developmentally transforming his or her own expressive and adaptive functioning and the world itself.

Embodiment is the affirmation that the lived body counts in our psychology. It is not a split-off disengaged agent that simply moves around peeking at a preformed world and drawing meaning directly from that world. It is not a set of genes that causes behavior nor a brain nor a culture. Behavior emerges from the embodied person actively engaged in the world. The concept of embodiment was first fully articulated in psychology by Maurice Merleau-Ponty (1962, 1963) and it represents a relational movement away from any split understanding of behavior as an additive product of biological and sociocultural determinants.

Embodiment is the claim that perception, thinking, feelings, desires—*the way we behave, experience, and live the world*—is contextualized by our being *active agents* with this *particular kind of body* (Taylor, 1995). The kind of body we have is a precondition for our having the kind of behaviors, experiences, and meanings that we have. As Johnson states, "Human beings are creatures of the flesh. What we can experience and how we make sense of what we experience depend on the kinds of bodies we have and on the ways we interact with the various environments we inhabit" (1999, p. 81).

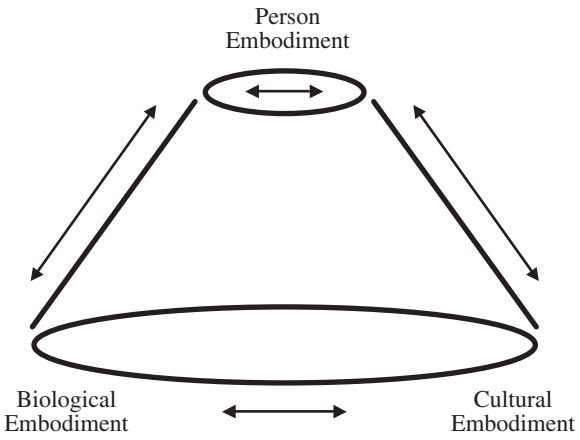


Figure 2.7 Embodied person, biology, culture.

As a relational concept embodiment includes not merely the physical structures of the body but *the body as a form of lived experience, actively engaged with the world of sociocultural and physical objects.* The *body as form* references the biological line of sight, the *body as lived experience* references the psychological subject standpoint, and the *body actively engaged with the world* represents the sociocultural point of view. Within a relational perspective, embodiment is a concept that bridges and joins in a unified whole these several research points of synthesis without any appeal to splits, foundationalism, elements, atomism, and reductionism (see Figure 2.7).

Biological Embodiment

Contemporary neuroscience has increasingly endorsed the significance of embodiment as an essential feature of the biological line of sight as it addresses psychological issues. For example, Antonio Damasio (1994, 1999)—exploring the neurological dimension of emotions—and Gerald Edelman (1992; Edelman & Tononi, 2000)—exploring the neurological dimensions of consciousness—along with Joseph LeDoux (1996)—exploring the neurological dimension of emotions—all support an embodied approach to biological-psychological inquiry and all argue that the cognitive, affective, and motivational systems and actions that constitute mind can no longer be thought of as the direct expression of genetic modularities (as nativists such as Steven Pinker, 1997, would claim), nor can they be thought of as a functionalist piece

of software, nor even as merely a function of brain processes. Rather, they argue, these meanings must be considered in a fully embodied context (see also, Gallese, 2000a, 2000b). As Damasio says:

> Mind is probably not conceivable without some sort of embodiment (1994, p. 234). And further, commenting on contemporary perspectives on mind, "This is Descartes' error: the abyssal separation between body and mind. . . . The Cartesian idea of a disembodied mind may well have been the source, by the middle of the twentieth century, for the metaphor of mind as software program . . . [and] there may be some Cartesian disembodiment also behind the thinking of neuroscientists who insist that the mind can be fully explained in terms of brain events [i.e., connectionism], leaving by the wayside the rest of the organism and the surrounding physical and social environment—and also leaving out the fact that part of the environment is itself a product of the organism's preceding actions." (1994, pp. 249–250)

Similarly, Edelman (1992) argues:

> The mind is embodied. It is necessarily the case that certain dictates of the body must be followed by the mind. . . . Symbols do not get assigned meanings by formal means; instead it is assumed that symbolic structures are meaningful *to begin with*. This is so because categories are determined by bodily structure and by adaptive use as a result of evolution and behavior. (p. 239)

Sociocultural Embodiment

From the cultural point of synthesis, social constructivists not committed to a split metatheoretical approach (e.g., Harre, 1995; Sampson, 1996) have come to embrace embodied action as a relational anchoring to the relativism of split-off discourse analysis. Sampson (1996) argues for "embodied discourses" as these "refer to the inherently embodied nature of all human endeavor, including talk, conversation and discourse itself" (p. 609; see also, Csordas, 1999; Ingold, 2000; Overton, 1997). Perhaps the most fully articulated contemporary employment of embodiment in a developmentally oriented cultural psychology is found in Boesch (1991). Boesch's presentation of *The I and the body* is a discussion of the centrality of embodiment for a cultural psychology. Thus, he states "The body, obviously, is more than just an object with anatomical and physiological properties: *it is the medium of our actions,* it is with our body that we both conceive and perform actions" (p. 312, emphasis added).

Person-Centered Embodiment, Action, and Development

The person-centered or psychological subject point of synthesis constitutes the standpoint that frames the major focus of any specifically psychological theory of development. This point of synthesis maintains a theoretical and empirical focus on the psychological processes and patterns of psychological processes as these explain the psychological subject's actions and the development of these actions in the world (see Figure 2.8–A). This approach to developmental inquiry requires the description of five critical interwoven concepts—*person, agent, action, experience, and person-embodiment.* Before detailing these concepts this person-centered standpoint needs to be briefly contrasted with what have been termed "variable" approaches.

Variable and Person-Centered Standpoints

Variable approaches focus inquiry on biological, cultural, and individual variables as these are understood to operate as predictors, correlates, risk factors, or antecedent causes of behavior. The distinction between this and a person-centered or child-centered standpoint is similar to that described some time ago by Block (1971), and more recently elaborated by Magnusson (1998; Magnusson & Stattin, 1998) and others (e.g., Cairns, Bergman, and Kagan, 1998; Hart, Atkins, & Fegley, 2003; NICHD Early Child Care Research Network, 2004; Robins & Tracy, 2003). As Magnusson has suggested, from a variable approach various individual

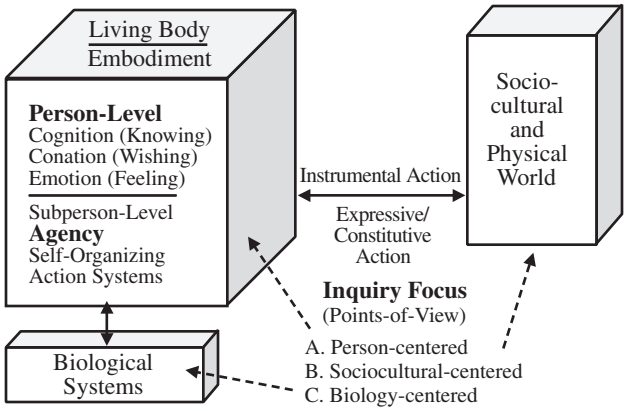


Figure 2.8 Embodied action: A relational approach to inquiry.

variables (i.e., "child factors," "child characteristics") and contextual environmental and biological variables are understood as the explanatory actors in the processes being studied (see Figure 2.9). From a person-centered standpoint, self-organizing dynamic action systems—which identify psychological mechanisms—operate as the main vehicles of explanation. Although variable approaches often suggest a split-off exclusivity, they can in fact be transformed into to yet another necessary point of view of relationally integrated inquiry. A variable-centered approach inquiry, aiming at the prediction of events, states, and movements, and a person-centered approach, aiming at explaining psychological processes and their transformation come into conflict only in the reductionistic case where one or the other is asserted as the exclusive foundational aim of inquiry. In this context, it is important to recognize that the complementarity here is one of aim and not one suggesting that variable inquiry is oriented to research methods and person-centered inquiry is oriented to conceptual context. Both approaches entail the translation of theory into the empirically assessable, and the translation of the empirically assessable into theory. Perhaps the clearest example of an important contemporary developmental theory that grounds itself within a variable tradition is found in Bronfenbrenner's bioecological model (Bronfenbrenner & Morris, 1998).

The single most important value of recognizing a person-centered standpoint as a necessary point of synthesis, along with the biological (Figure 2.8–B) and cultural (Figure 2.8–C) points of synthesis, is that it rescues psychology generally, and developmental psychology specifically, from becoming a mere adjunct to biology, culture, discourse, narrative, or computer science. *Psyche* initially referenced "soul" and later "mind," and if psychology is not to again lose its mind—as it did in the days of the hegemony of behaviorism—keeping the psychological subject as the center of action is a necessary guard against explanatory reduction to biology, culture, discourse, and so on.

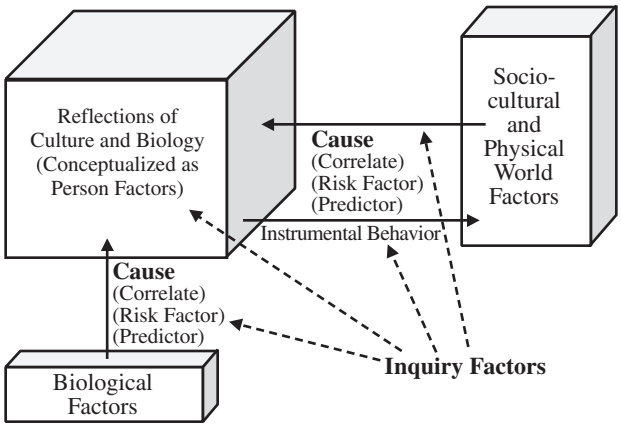


Figure 2.9 A variable approach to inquiry.

The second benefit that accrues to maintaining, a person-centered approach as a necessary point of view is that this perspective again highlights the fact that any act can be profitably understood—in a complementary bipolar fashion—as both *expressive-constitutive and as instrumental-adaptive.* Split or dichotomous approaches—especially split-off variable approaches—lead to the illusion that acts exhibit only adaptive-instrumental-communicative functions. A person-centered approach argues that any act may also be understood as an expression of an underlying dynamic organization of cognitive, affective, and conative meanings, and this expression operates to constitute the world as known, felt, and desired. Here, Bloom's work (Bloom & Tinker, 2001) on the development of language provides an excellent illustration of the power of conceptualizing language acquisition in the context of the expression of person-centered cognitive, affective, and conative-motivational meanings, rather than exclusively as an instrumental tool operating solely for communicative ends.

A third benefit derived from a person-centered point of view is that it provides the necessary context for the resolution of certain important problems related to our general understanding of psychological meaning. Specifically, a person-centered approach is a necessary frame for solving the so-called symbol-grounding problem. This is the question of how to explain that representational items (i.e., a symbol, an image) come to have psychological meaning (Bickhard, 1993). I return to this problem in a more detailed fashion later.

With these examples of some of the benefits of a child- or person-centered approach to developmental inquiry as background, it is possible to turn to a specific description of this metatheoretical approach, which entails the five critical interwoven concepts of *person, agent, action, experience, and person-embodiment.*

Person-Agent

Person and agent are complementary Escherian levels of analysis of the same whole (see Figure 2.8–A). The person

level is constituted by genuine psychological concepts (e.g., thoughts, feelings, desires, wishes) that have intentional qualities, are open to interpretation, and are available to consciousness (Shanon, 1993), or in other words have psychological meaning. The agent level—called the subpersonal level by some (Dennett, 1987; Russell, 1996)—here refers to action systems or dynamic self-organizing systems. "Schemes," "operations," "ego," "attachment behavioral system," and "executive function" are some of the concepts that describe these action systems.

Taken as a whole, the person-agent forms the nucleus of a psychological metatheory of mind. And, in this context, mind is defined as a self-organizing dynamic system of cognitive (knowings, beliefs), emotional (feelings), and conative or motivational (wishes, desires) meanings or understandings, along with procedures for maintaining, implementing, and changing these meanings. Importantly, it must be noted and underlined that a person-centered metatheory of mind is not an encapsulated cognition but a theory that includes emotions, wishes, desires, and cognition. Further, there is no question about where mind is located: Mind emerges from a relational bio-sociocultural activity matrix. In the present context, mind is a person-centered concept because the approach being described takes the *person standpoint.* As a person-centered concept, mind bridges naturally to both the biological (Figure 2.8–C) and the sociocultural (Figure 2.8–B).

Action, Intention, Behavior

Person-agency is the source of action and a person-centered approach establishes the framework for what has traditionally been termed an *action theory* (Brandstädter, 1998; Brandstädter & Lerner, 1999; Mueller & Overton, 1998a). At the *agent level,* where it is not necessary to limit a definition to the human organism, action is defined as the *characteristic functioning of any dynamic self-organizing system.* For example, a plant orients toward the sun. Weather systems form high and low pressure areas and move from west to east. Alternatively, human systems organize and adapt to their biological and sociocultural worlds. At the *person level,* action is defined as *intentional activity* (i.e., meaning giving activity). Intentionality, however, is not to be identified with consciousness: While all acts are intentional, only some intentions are conscious or self-conscious. In a similar fashion, intention is not to be identified solely with a symbolic level of reflection. Following Brentano (1973/1874), all acts, even those occurring at the most sensory-motor level of functioning intend some object.

Action is often distinguishable from *behavior,* as the action of the person-agent implies a *transformation* in the intended object of action, while behavior often simply implies movement and states (e.g., the classically defined "response" was understood as specific movement in space and time—a behavior—see von Wright, 1971, p. 199). As action, when the infant chews (act)—something that from a *sociocultural standpoint* is called a "basket"—the infant, from a *person-centered standpoint,* is transforming this part of her known world into a practical action—chewable. Piaget's cognitive developmental theory is a good example of a child-centered developmental action theory where the metatheoretical "action" becomes translated into specific theoretical concepts. Thus, Piaget's basic theoretical concepts of "function," "assimilation," "accommodation," "operation," "reflective abstraction," all reference action. And Piaget (1967) repeatedly affirms the centrality of action throughout his writings: "I think that human knowledge is essentially active. To know is to assimilate reality into systems of transformations. To know is to transform reality. . . . To my way of thinking, knowing an object does not mean copying it—it means acting upon it" (p. 15). "To know an object . . . is to act on it so as to transform it" (1977, p. 30). "Nothing is knowable unless the subject acts in one way or another on the surrounding world" (1980, p. 43).

Action serves at least three major functions in the development of mind (see Figure 2.1). First, *action expresses cognitive-affective-conative meaning.* It is important to recognize that meaning, like many other basic concepts, has relational complementary definitions that are determined by the standpoint being taken (Overton, 1994b). "I mean" and "it means" operate in a relational matrix. The former is concerned with person-centered meanings, the latter with sociocultural meanings and reference. From a person-centered standpoint, the focus of analysis is on "I mean" and secondarily on how "I mean" becomes associated with "it means." Considered in its expressive moment, action entails the projection of person-centered meanings, thus transforming the objective environmental world (i.e., an object point of view) into an actual world as known, felt, desired. World, here is another relational bi-polar concept. The *actual* world

is the world of meanings constructed by the person—the known world; the *environmental or objective* world is the world of reference, examined from a sociocultural standpoint.

The second function that action serves is the *instrumental function of communicating and adjusting person-centered meanings.* Communication, dialogue, discourse, and problem solving all call attention to the relational to-and-fro movement between the expression of the self-organizing system, and instrumental adaptive changes. Completely adapted (i.e., successful) action entails only the *projection* of meaning onto the world (e.g., If I intend this object before me to hold water as a cup, and successfully drink from it, no change occurs in my conceptual system). Partially adapted (i.e., partially successful) action results in exploratory action, or *variations* (e.g., If the intended cup leads to water leaking onto my shirt, I vary my actions such as putting my finger across a crack in the object). Exploratory action that is adaptive (e.g., The finger placement permits successful drinking) leads to reorganization of the system (transformational change) and new meanings (e.g., A cup is an object without open cracks).

Experience and Action. This general cycle of projected action, and exploratory variational action as the accommodation to encountered resistances, constitutes the third and most general function of action: *Action defines the general mechanism of all psychological development.* From a person-centered developmental action standpoint *all development is explained by the action of the subject.* However, this metatheoretical concept will be translated into specific theoretical concepts at the level of theory itself (e.g., Piaget's concepts of assimilation-accommodation and equilibration identify action mechanisms of development).

In claiming that action is the general mechanism of all development, it is necessary to recognize that within an action based perspective *action and experience are identical concepts.* As a consequence, the claim that action is the mechanism of development is identical to the claim that experience is the mechanism of development. All development occurs through experience. But in this definition it should be clear that experience as action excludes neither the biological nor the sociocultural. In fact, experience understood as action of the person-agent represents a synthesis of these two.

Experience is itself yet another concept that acquires alternative meanings depending on whether the focus is from the person-agent or the objective environmental standpoint. From each perspective, experience is identified as the interaction of the act and the environment (i.e., acts intend objects), but each has a distinct emphasis regarding the locus of this interaction. From the person-agent standpoint (Figure 2.8–A), *experience is the action of exploring, manipulating, and observing the world,* while from an environmental standpoint (Figure 2.8–C), *experience is an objective event or stimulus present in the context of the act.* As understood from the person-agent standpoint, when experience is described as a feeling, the reference here is the person-centered felt meaning of the observational, manipulative, and explorational action.

In the history of psychology, and especially developmental psychology, the complementarity of these usages has often been lost in a world of split metatheory. As a consequence, implicitly or explicitly, experience has frequently been identified with, and only with, the objective stimulus. When this privileging of the stimulus occurs it carries with it the split metatheoretical principle of investing the privileged concept with a causal power. Consider, for example:

> For Schneirla, experience referred to all stimulus influences that act on the organism throughout the course of its life. . . . Any stimulative influence, any stimulus that acts on the organism in any way, is a part of experience. (Lerner, 2002, p. 152)

Here, experience is both defined exclusively by the stimulus and the stimulus is conceptualized as causally acting on. The consequence of such split understandings is that they again draw us back into a fruitless nature-nurture debate in which "experience" become pitted against "innate" or against "biological maturation" as one of two competing alternative explanation of behavior; thus, empty questions such as "Does experience influence behavior and change?" "How much does experience count in adolescence?" rise to the fore. When, on the other hand, experience is conceptualized as the complementary "act-environment," these and all other nature-nurture questions disappear, being replaced by empirical explorations that examine acts in relation to their source (person-agent) or acts in relation to the environment (see Overton & Ennis, in press).

When experience is understood as entailing the developmental *action cycle* of projection-transformation (of the known world) exploration-transformation (of the system), experience also becomes the psychological

bridge between biological and cultural systems. There is no sense here of an isolated, cut off, solitary human psyche. Person-centered experience emerges from a bio-sociocultural relational activity matrix (see, for example, Gallese 2000a, 2000b; Suomi, 2000) and this experience both transforms the matrix and is transformed by the matrix. Person development is not a split-off nativism or environmentalism, or a split-off additive combination of the two. The neonate is a dynamic system of practical action meanings. These meanings represent the outcome of 9 months of the interpenetrating action of biology-environment, and this interpenetration stretches all the way down to DNA (Gottlieb, 2002; Lewontin, 2000). Finally, it cannot be repeated too frequently that to say that development is explained by experience does not deny that development is explained by biology and that development is explained by culture. What is denied is the absolute exclusivity of any of these standpoint explanations.

Development of Person-Agent

Psychological development of the person-agent entails the epigenetic stance that novel forms emerge through the interpenetrating actions of the target system, and the resistances the target system encounters in both the actual and objective sociocultural and physical environment. It is through interpenetrating actions that the system changes and becomes differentiated. But differentiation of parts implies a novel coordination of parts and this coordination itself identifies the emergence of novelty (see Figure 2.2). Thus, as suggested earlier, the neurological action system becomes differentiated through the interpenetrating actions of neurological-environmental functioning. This differentiation leads to a novel coordination or reorganization that eventually leads to the adapted level of conscious practical action found in the neonate. Consciousness is a systemic property of this emergent action system. The initial adapted practical consciousness is a minimum awareness of the meaning entailed by an act (Zelazo, 1996). Consciousness cannot be reduced to or "squeezed" out of lower stages, it is the result of a transformation. Similarly, further developmental differentiations and coordinations of actions—described as higher levels of consciousness—emerge through the interpenetrations of conscious action and the sociocultural and physical worlds it encounters (see Figure 2.2). Symbolic meaning and the symbolic representational level of meanings (Mueller & Overton, 1998a, 1998b) describes forms of consciousness that arise from the coordination of practical actions; reflective and transreflective (reflective symbolic understandings of reflective symbolic understandings) meanings describe further developmental advances in the coordination of action systems.

In summary, to this point the nucleus of a relationally informed person-centered developmental action metatheory of mind has been described, where mind is conceptualized as a dynamic self-organizing system of cognitive (knowings, beliefs), emotional (feelings), and conative or motivational (wishes, desires) meanings or understandings, along with procedures for maintaining, implementing, and changing these meanings. Mind, through expressive projections—transforms the world as known, and—through adaptive exploration—transforms itself (i.e., develops). However, this remains a nucleus and only a nucleus, because it lacks the critical necessary feature of embodiment.

Person-Agent Embodied Actions

Person-agency is the source of action, and action is the source of meaning; but this action itself is embodied. As discussed earlier, embodiment is the claim that our perception, thinking, feelings, desires—the way we experience or live the world—is contextualized by our being active agents with this particular kind of body. At the agent level, embodiment specifies the characteristic nature of the activity of any living system (e.g., the actual world of the fly is necessarily shaped by the nature of the fly's embodied acts). At the person level, embodiment affirms that—from the beginning—bodily acts constrain and inform the nature of intentionality (Margolis, 1987). Intentionality is not limited to a symbolic, reflective, or transreflective system of psychological meanings. Intentionality also extends to a system of psychological meanings that characterize practical embodied actions operating at the most minimum level of consciousness. These most basic meanings and all others "come from having a body with particular perceptual and motor capabilities that are inseparably linked" (Thelen, Schöner, Scheier, & Smith, 2001, p. 1). They arise—as Piaget repeatedly insisted—from the sensorymotor functioning that represents a concrete instantiation of embodied actions.

Varela et al. (1991) have sketched a general outline for an embodied theory of cognition. Sheets-Johnstone (1990) provides an evolutionary anthropological perspective on human embodiment and thought, and Santostefano (1995) has detailed the emotional and

cognitive dimensions of practical, symbolic, and reflective embodied meanings. Further, many who have studied psychopathology, from R. D. Laing (1960) to Donald Winnicott (1965) and Thomas Ogden (1986), argue that disruptions in the embodied actions of the person-agent are central to an understanding of the development of severe forms of psychopathology (see Overton and Horowitz, 1991).

At the level of practical actions (see Figure 2.2), Bermudez's (1998) work on the development of self-consciousness is central to an understanding of the impact of an embodied person conceptualization. Bermudez's fundamental argument is that late emerging forms of meaning found in symbolic and reflective consciousness develop from—and are constrained by—embodied self-organizing action systems available to the infant. Most important, these early systems entail person-level somatic proprioception and exteroception. As these person-centered processes interpenetrate the physical and sociocultural worlds, proprioception operates as the differentiation mechanism for the emergence of a self-consciousness action system, and exteroception operates as the differentiation mechanism for the emergence of an object-consciousness system. Hence, over the first several months of life a basic practical action associated with "me" and "other" develops, which in turn becomes transformed into the symbolic "me" and "other" of early toddlerhood. Thelen's (2000) work on the role of movement generally, and specifically "body memory," in infant cognitive functioning is another closely related area that illustrates the importance of embodiment at the level of practical actions.

Langer's (1994) empirical studies represent important demonstrations of the intercoordination of embodied action systems as these intercoordinations move development from the practical to the symbolic plane of meaning (see Figure 2.2). Earlier work by Held and his colleagues (e.g., Held & Bossom, 1961; Held & Hein, 1958) illustrates the significance of *voluntary* embodied action at all levels of adaptation. Goodwyn, & Acredolo (1993) research on the use of bodily gestures as signs expressing practical meanings in older infants suggests the expressive and instrumental value of embodied practical gesture. Other work has elaborated on the significance of bodily representations at the symbolic and reflective levels of meaning. For example, while the use of fingers for counting is well documented (Gelman & Williams, 1998), Saxe's (1981, 1995) research has shown cross-culturally that other bodily representations enter into counting systems. Further, earlier research by Overton and Jackson (1973) and more recently by Dick, Overton, and Kovacs (2005) has demonstrated that bodily gestures support emerging symbolic representations at least until the level of reflective meanings.

At the level of symbolic, reflective, and transreflective conceptual functioning (see Figure 2.2), the writings of Lakoff and Johnson (1999; see also, Lakoff, 1987) are well known for their detailed exploration of the significance of embodiment. For Lakoff and Johnson, embodiment provides the fundamental metaphors that shape meanings at all levels of functioning. In a parallel but distinct approach, Kainz (1988) has described how the basic laws of ordinary logic (i.e., the law of identity, the law of contradictions, and the law of the excluded middle) can be understood as emerging from the early embodied differentiation of self and other. Finally, Liben's (1999) work on the development of the child's symbolic and reflective spatial understanding presents a strong argument for an understanding of this development in the context of an embodied child rather than in the context of the disembodied eye that traditionally has framed this domain.

EPISTEMOLOGICAL-ONTOLOGICAL ISSUES

In broad outline, to this point the chapter has explored the nature of the concept of development and related concepts as they are grounded and sustained within a hierarchy of metatheories. The discussed metatheories—split, relational, embodied action, developmental systems—are themselves contextualized by metatheoretical concepts that operate at yet a higher level of discourse (see Figure 2.1). These are the *epistemological* (i.e., issues of knowing) and *ontological* (i.e., issues of reality) level of metatheory to which we turn next. The conceptual issues that are illustrated at these levels have evolved across the course of history, and any clear exposition of these issues itself necessitates an historical approach.

Metaphysics is the broad area of philosophical inquiry concerned with conceptual inquiry into the nature, origin, and structure of the world or "being." *Ontology* is the domain of metaphysics concerned with question of what constitutes the Real with a capital R (Putnam, 1987). *Epistemology* is about knowing, and its primary question concerns the validity of what and how we know. Understood relationally, epistemology is a narrative about how we know what is Real, and ontology is a narrative about the Real as we know it. Historically,

each domain has offered sets of alternatives in answer to its fundamental question. The basic epistemological candidates for yielding valid knowledge have been *reason and observation.* In the ontological domain, matter and form have been primary candidates for the Real. When matter is interpreted as bits, or elements, or uniform pieces, and form is taken as pattern, structure, or organization, then *uniformity and organization,* as the surrogates of matter and form respectively, are the candidates for what constitutes the Real. A related set of candidates for the nature of the Real concerns the assumed activity status of matter and form. The Real may be assumed to be fundamentally *inactive and unchanging,* or it may be assumed to be fundamentally *active and changing.* Thus, it is possible to conceptualize (a) an inactive and unchanging matter—a Newtonian favorite; (b) an active and changing matter—a pre-Newtonian understanding, as well as Einstein's post-Newtonian understanding of the nature of the physical world; (c) an inactive and unchanging form—a position often attributed to Plato; and (d) an active and changing form—Leibniz's monadology and Hegel's dialectic.

In discussing ontology and the Real, it cannot be too strongly emphasized that there is a critical distinction between the use of the term "real" in everyday commonsense life and the ontological. No one argues that there is a lack of reality or realness in the experienced everyday world. This is commonsense realism. Commonsense realism accepts the material existence of a real, actual, or manifest world and all ontological-epistemological perspectives treat people, and animals, and physical objects as having such a real existence. The ontological issue of the Real with a capital R (Putnam, 1987) is a very different issue. It concerns the idea of having a base or foundation from which everything else emerges. In this limited sense, the Real is defined as that which is not dependent on something else, or that which cannot be reduced to something else.

If we were to approach the issue from a split understanding, then matter and form would become a dichotomy. In this case, the assertion of *either* matter *or* form as the Real would privilege the former and marginalize the latter as reducible Appearance. Asserting split matter to be the Real yields a *materialist ontology.* Within this ontological position, form, pattern, organization, and ideas are cast as appearances that ultimately are assumed to find their source or origin in the foundational Real (i.e., matter). For example, when the concept "system," is used within this split ontological frame, it simply references the individual elements of matter such as neurons. Or, as a social example, "community" merely refers to the linear aggregate of individuals. Choosing split-off form as the foundational Real would assert an *idealist ontology.* In this choice elements, individuals, and bits, would achieve an identity only in the context of the pattern or form that would constitute the Real. Within this ontological context, "system" would be the foundational Real, and matter, such as neurons, a mere reflection of this Real. "Community" in this case would be foundational and "individuals" would be taken to be an expression of this form. When the narrative is split, as in these cases, the Real becomes an absolute foundation and this is referred to as *foundationalism or a foundationalist position.*

Plato and Aristotle and the Relational Developmental Tradition

For Plato and Aristotle, there were no radical splits between ontology and epistemology or between the alternatives in each domain. Each took the problem of knowing as his focus. Both reason and observation, and form and matter constituted an indissociable complementary matrix for understanding the world. Plato favored an epistemological emphasis on reason; Aristotle articulated more precisely the dialectical balance of reason and observation. Plato's point of view, or line of sight, began from the ontological significance of form or pattern described in his doctrine of Ideas. However, he admitted another line of sight, which was matter as a "formless, indefinite, substrate of things" (Stace, 1924). Aristotle emphasized the significance of the relational nature of form and matter. Form and matter were understood as dialectically related, as in Escher's *Drawing Hands.* Formless matter or matterless form were simply not possible. Aristotle maintained that only individual things exist, but "existence" did not imply a simple split-off matter. Existence implied matter in the context of the categories (forms) of space and time. Thus, existence was not the criterion of the Real; the relational form/matter constituted the Real. As Ross (1959) points out, " 'Matter' is not for Aristotle a certain kind of thing as we speak of matter in opposition to mind. It is a purely relative term—relative to form" (p. 76).

Plato and Aristotle also held a relational view of inactivity-fixity (termed "Being") and activity-change (termed "Becoming"). Plato is most widely known for his postulation of a realm of timeless forms (i.e., a realm of the unchanging). In modern times, this notion has cast Plato as the father of the search for "essences"

of nature and, thus, what has been called *essentialism* (see Mayr, 1982). Conceived in this split fashion, the fixed forms of essentialism constitute the conceptual grounding for contemporary nativist positions that interpret "structure" and "organization" as fixed and unchanging. It is unlikely, however, that Plato intended this split interpretation (Cornford, 1937; Lovejoy, 1936; Nisbet, 1969), as Plato himself specifically stated, "that *only* the divine is changeless; that the world of man and society is an incessant process of development and of becoming" (Nisbet, 1969, p. 308).

Aristotle's relational understanding of the nature of *being* (static, fixed, inactive, unchanging) and *becoming* (active, changing) is expressed in his concepts of the "potentiality" and "actuality" of individual things. The actuality of an object of inquiry (i.e., what the object is at a given moment) points to its being. The passage from potentiality to actuality points to the becoming of the object (Ross, 1959, p. 176; Wartofsky, 1968). Coming into being (i.e., becoming) constituted Aristotle's conceptualization of developmental change and—as in the unified definition of development elaborated earlier in this chapter—he emphasized both the transformational and variational nature of change as critical relational features of becoming. Aristotle referred to transformational change as "generation and destruction," and variational change "alteration" (Ross, 1959, p. 101–102). Despite the centrality of development (i.e., becoming) to his system, it is often suggested that Aristotle's ideas promoted an understanding of nature as a hierarchical organization of unchanging forms that later became celebrated as the *scala naturae* or "The Great Chain of Being" (Lovejoy, 1936). The attribution of this nonevolutionary and, hence, nondevelopmental view of nature to Aristotle confuses his ontological-epistemological stance with the proposal of a single possible biological classificatory system (Lovejoy, 1936, p. 58). Aristotle was the champion of a logic of classification, but the other side of the story is that he also recognized the dangers and limitations of any specific system of classification. Today, to characterize Aristotle as an antievolutionist who promotes a static conception of hierarchical forms (see Mayr, 1982) misses the relational character of Aristotle's work.

Modernity and the Rise of the Split Tradition

In the seventeenth century with the dawn of the modern age or "modernity," split metatheory began its historical journey. The story of modernity is defined both by a quest for absolute certainty of knowledge (Toulmin, 1990) and by an effort to expand individual freedom, especially freedom of thought. Building knowledge on rational and reasoned grounds, rather than on the grounds of authority and dogma, was understood as the key to each of these goals. The early protagonists who developed the basic story line were Galileo Galilei, and his physics of a natural world *disconnected* from mind; Rene Descartes, whose epistemology elevated disconnection or splitting to a first principle; and Thomas Hobbes, who saw both mind and nature in a vision of atomistic materialism. Of the three, Descartes was to have the greatest and most lasting impact on the formation of split metatheory.

Descartes major contributions entailed the introduction and articulation of *splitting and foundationalism* as core interrelated epistemological themes. As described earlier splitting is the formation of a dichotomy—of an exclusive either/or relationship—and foundationalism is claim that one or the other elements of the formed dichotomy constitutes the ultimate Real. Nature and nurture, idealism and materialism (form and matter), reason and observation, subject and object, constancy and change, biology and culture, and so on all can be—and under the influence of Cartesian epistemology are—thought of as split-off competing alternatives. Privilege the one as the Real—as the *foundation*—and it follows under a split interpretation that the other is marginalized as mere appearance or epiphenomenal.

The foundation here is the final achievement of absolute certainty and the end of doubt. The foundation is not a vantage point, standpoint, or point of view, and certainty and doubt are not dialectically related as an identity of opposites. Descartes's foundationalism describes *the* final fixed secure base. It constitutes an absolute, fixed, unchanging bedrock; a final Archimedes point (Descartes, 1969).

With splitting and foundationalism in place, the theme of *reductionism* was firmly planted in the history of this tradition, and virtually all change to the present day represents elaboration and variation of the idea that Appearance will ultimately be reduced to (i.e., explained by) the Real. "Eliminative reductionism," "ontological-reductionism," "property ontological-reductionism," "theoretical-reductionism," "definitional-reductionism," "causal reductionism," (Searle, 1992) "radical or leveling reductionism," "microreductionism," "smooth reductionism," "semantic reductionism" (Shanon, 1993), and

"biosociological reductionsim" (Bunge & Ardila, 1987)—while each making interesting and valuable discriminations to the plot line—add little to the theme (Overton, 2002).

Having literally invented *dualism* by splitting the Real into a Subject piece and an Object piece, Descartes—and all others who have since accepted the Cartesian categories—was faced with the problem of how to put the individual pieces back together again. If there is an absolute bedrock to nature and this bedrock is composed of individual elements, there must be a glue that can join the pieces into the appearance of wholeness. Descartes favored the solution called *interactionism,* a solution not unlike some of the "conventional" interactionist positions discussed earlier with respect to the nature-nurture issue. According to conventional interactionism any behavior is explained as the additive outcome of pure forms of fixed elements labeled nature and pure forms of fixed elements labeled nurture.

Empiricism, Materialism, and Objectivism

Cartesian splitting and foundationalism came to operate as a permanent background frame for modernity's split tradition. However, the specification of the *nature* of the ultimate foundation remained at issue. It was left to Hobbes and later empiricists to operate within the frame of subject split from object, mind split from body, ideas split from matter, and to build into this frame the materialist identification of *atomistic matter* as the ultimate ontological foundation—the Real. In the eighteenth century—a period called the Enlightenment—British empiricism arose as a protest against the rational and subjective elements found in Descartes—against both the "*I*" and the "*think*" of the famous "I think, therefore I am." In the epistemological writings of John Locke, George Berkeley, and David Hume, reason became split off from observation and *empiricism* arose as the doctrine that all knowledge originates in the senses (observation) and only the senses and, hence, all knowledge must ultimately be reducible to sense information (see Overton, 1998 for an extended discussion). This empiricist line of modernity continued to pursue the goal of building knowledge on rational and reasoned grounds, but the rational and reason came to be considered acquisitions, which in turn needed to be explained as arising from the senses and only from the senses. This forced monism operated to marginalize subjectivity, mind, or ideas, thereby creating *objectivism*; the belief that the ultimate material Reality exists as an absolute—independent of mind or knower (Searle, 1992). This constituted, as Putnam (1990) has said, an epistemological "God's eye view."

Objectivist matter thus came to constitute the ontological Real to which the manifold of commonsense experience would be reduced to arrive at the goal of science; a systematized body of *certain* empirical knowledge. Support for the materialist foundation arose and was further defined by Newton's contributions. Central among these was the redefinition of the nature of matter in a way that conceived of all bodies as fundamentally inactive. Prior to Newton, matter was understood as inherently active. Matter had been conceived in terms of the relation of being (static, fixed) and becoming (active, changing). Newton, however, through his concept of inertia, split activity (becoming) and matter (being) and redefined matter as inactivity (Prosch, 1964).

The redefinition of bodies as inert matter, and the assumption of the atomicity of matter (i.e., bodies are ultimately aggregates of elemental matter that is uniform in nature, and in combination, yields the things of the world), were basic for Newton's formulation of his laws of motion. However, they were also ideas that a later generation generalized into a metaphysical worldview that identified the nature of the Real as fixed inert matter and *only* fixed inert matter. This "billiard ball" or "mechanistic" worldview entailed "the notion that basically everything . . . was made up of small, solid particles, in themselves inert, but always in motion and elasticitly [sic] rebounding from each other, . . . and operating mechanically" (Prosch, 1964, p. 66). Within this split worldview, all human psychological processes, including the cognitive (perception, thought, reasoning, memory, language), the affective (emotions), and the conative (motivation, wishes, desires), were necessarily reduced to a bedrock of sensations. Associations were used as the glue designed to explain how from these simple sensations it would be possible to have the complex ideas, emotions, and desires that are apparent in commonsense understanding.

With these themes at hand—*splitting, foundationalism, materialism, objectivism*—it was a short epistemological step to the formulation of a complete scientific methodology termed "mechanical explanation" that with relatively minor modifications has extended to the present day as the basic methodology of neopositivism and later instrumentalism, conventionalism, and functionalism. This notion of explanation is discussed in a later section on methodology.

While the eighteenth century empiricists focused their enquiry primarily on cognitive issues ("complex ideas") in the nineteenth century, the Utilitarian philosophy of Jeremy Bentham, passed down through James and John Stuart Mill, and Alexander Baine, sought an extension of the empiricist doctrine by applying the Newtonian paradigm to the explanation of actions, values, morals, and politics (Halevy, 1955). The *experimental* psychologies of Wundt and Titchener grew from this ground, followed by the functionalist perspectives of Angell, Carr, Woodworth, and, ultimately, behaviorism and multiple forms of neobehaviorism, including learning theories and social learning theories of development. With behaviorism, "stimuli" and "responses" came to replace the earlier "sensations" as bedrock explanatory concepts.

In the twentieth century, the split tradition continued operating as a metatheory for various domains of inquiry, including developmental inquiry. In philosophy, the tradition extended its influence in the articulation of Anglo-American analytic philosophy. As the name suggests, analytic philosophy has continued to maintain the Cartesian split categories and to the present day, in various surrogate forms, pursue the analytic ideal of finding the "atoms," or absolute bedrock foundational elements of knowing (Rorty, 1979). The British line of this approach located its foundationalism in the analysis of "ordinary language." The American line pursued the same goal in the "neutral data language" and "observation sentences" of neopositivism, elaborated in the writings of Moritz Schlick, Roudolf Carnap, Gustav Bergmann, Herbert Feigl, Carl Hempel, A. J. Ayer, and the "earlier" Ludwig Wittgenstein (of the *Tractatus Logico-Philosophicus*).

Modernity and the Elaboration of Relational Metatheory

As British empiricism followed its route of splitting and foundationalism, the German modern period continued to elaborate relational epistemological and ontological issue. At the forefront of the German Enlightenment stands Leibniz's grand synthesis of a universal mathematics and a metaphysics of individuality (Gadamer, 1993). For Leibniz, epistemology as the universal, the knowing of the Subject, was joined in a relational matrix with ontology as the particular, the being of the Object. The twentieth-century philosopher, Ernst Cassirer (1951) captures this fundamental relational quality of Leibniz's work when he asserts that "the central thought of Leibniz's philosophy is therefore to be looked for neither in the concept of individuality nor in that of universality. These concepts are explicable only in mutual relationship; they reflect one another" (p. 33).

Leibniz

With ontology as the line of sight, Leibniz, a contemporary of Locke, refused to split off being from becoming. Activity and ceaseless change were fundamental to the nature of the Real. In his concept of substance, Leibniz substituted a "pluralistic universe" in place of Descartes's dualism and Locke's materialist monism. Leibniz's "monad" is the fundamental unit of this universe. The monad " 'is' only in so far as it is active, and its activity consists in a continuous transition from one new state to another as it produces these states out of itself in unceasing succession. . . . Never is one of these elements just like another; never can it be resolved into the same sum of purely static qualities" (Cassirer, 1951, p. 29). "In Leibniz's philosophy an inalienable prerogative is first gained for the individual entity. The individual no longer functions as a special case, as an example; it now expresses something essential in itself. . . . Every individual substance is not only a fragment of the universe, it is the universe itself seen from a particular viewpoint. And only the totality of these unique points of view gives us the truth of reality" (Cassirer, 1951, pp. 32–33).

From an epistemological line of sight, if substance is in "continuous transition from one state to another," then understanding entails the rational discovery of the rule of this transition and the laws according to which it occurs. This is Leibniz's rationalism. It differs significantly from Descartes's in that there is no return to God as the imprinter of these universal ideas, nor is reason split from observation. Universal ideas as rules and laws, and particular experiences as observations, are relational or co-relational. Knowing may begin in observation, but observation proceeds in the context of some system, idea, or form. Analysis is not suppressed in Leibniz's system; it occupies a significant place in his thought. However, analysis is not privileged over synthesis; all analysis implies a whole or synthetic aspect according to which the analysis proceeds. Cassirer (1951) points out that, for Leibniz, the "concept of the *whole* has gained a different and deeper significance. For the universal whole, which is to be grasped can no longer be reduced to a mere sum of its parts. The new whole is organic, not mechanical; its nature does not consist in the sum of its parts but is presupposed by its parts and con-

stitutes the condition of the possibility of their nature and being" (p. 31).

The Leibnizian tradition is a relational tradition, and it emerged, as Cassirer suggests, from an organic understanding of the nature of events and the nature of knowing. Thus, it was within an emerging organic worldview that specific features of the relational ontological-epistemological ground came to be articulated. The significance of the legacy of the Leibnizian relational tradition for developmental inquiry is—like the significance of the legacy of the Newtonian split tradition—severalfold. First, it established a distinct rationale for the proposal that knowing necessarily proceeds from a "point of view" or line of sight. The importance of perspective or point of view is traceable to Plato (Kainz, 1988), but Leibniz gave it a central significance by embedding it in the relational context of parts to whole. *Point of view* does not imply an unrestrained relativism as it sometimes seems to suggest in contemporary usage. A "point of view" within the Leibnizian tradition, only becomes a point of view as it is embedded with other points of view within a broader context. For example, Subject and Object become "points of view" only within a broader organic unity that joins the two within a relational matrix. Without this unity, they are simply isolated elements and the application of the phrase "point of view" is quite meaningless.

In the postmodern era of contemporary Continental philosophy, point of view continues to exert a strong influence through the concept of "horizon" of understanding or inquiry. The notion of horizon appears in the works of Nietzsche and Husserl, but it has been most fully developed in the hermeneutics of Hans-Georg Gadamer (1989). A *horizon* is the entire range of understanding that can be generated from a particular vantage point. Achieving a horizon entails placing something in the foreground or what is termed the process of *foregrounding,* a methodological principle that is inherently relational in nature. Whatever is foregrounded must be foregrounded from something else. Consequently, foregrounding makes visible this other that is joined with it in a relational matrix. With respect to developmental inquiry, for example, to "foreground" the subject is to recognize the object; to foreground the expressive is to recognize the instrumental, or to foreground the transformational is to recognize the variational. It is the reciprocity of horizons, or what is termed the *fusion of horizons* that ultimately constitutes truth in such a relational system. The situation here is similar to the familiar reversible figure of the vase-person. From one vantage point, we foreground, and, thus, acquire the horizon of two faces turned toward each other. The two faces become a legitimate object of inquiry, moving toward a full achievement of this horizon. From another vantage point, a vase is foregrounded and a different horizon is acquired. Both horizons yield legitimate objects of study; yet, both are parts of the one whole, and that whole constitutes the fusion of horizons.

Other developmental implications of the Leibnizian relational tradition follow from the principle that activity, change, and organization are as fundamental as stability, fixity, and uniformity. Activity-stability, change-fixity, and organization-uniformity compose the bipolarities, or relative moments, of the ontological-epistemological relational matrix. This became the principle of *Becoming* in philosophical and developmental inquiry (Overton, 1991b). As suggested earlier, it contrasts directly with the Newtonian-Humean tradition of split off *Being,* where activity, change (other than random variation), and organization are treated as ultimately reducible Appearances.

The principle of Becoming, whose origins are traceable to the pre-Socratic works of Anaximander and Heraclitus (Wartofsky, 1968), takes, as its line of sight, activity, change, and organization as necessary and nonreducible features of the cosmos (Allport, 1955; Nisbet, 1969). In the eighteenth century, Becoming was generalized from Leibniz's ontology to an understanding of man, society, and nature.

In 1725, Giambattista Vico attacked the static view of human nature and proposed that changes of society are the reflection of the imminent and necessary development of the human mind. In 1755, Kant, in his *General History of Nature and Theory of the Heavens,* applied the notion of Becoming to the material world, and maintained that this world continuously evolves in a systematic and ordered fashion. And from 1784 on, in a series of four volumes, Johann Gottfried Herder extended the idea of Becoming to include nature, living species, and human society alike (Toulmin & Goodfield, 1965).

Hegel

In the late eighteenth and early nineteenth centuries, the most influential figure to advance the principle of Becoming was G. W. F. Hegel (1770–1831). For Hegel, history was a necessary dynamic process of growth, defined as expressive-transformational change. The nature of this change was defined by the dialectic (see earlier discussion), a process through which concepts or fundamental

features of a system *differentiate* and move toward *integration.* This process, suggests a grounding for understanding change as directional. In split understandings, there must always be a controversy over whether change is best characterized as *either* cyclical (variational) *or* directional (transformational). Within the dialectical context, this dichotomy is resolved through recognition that the polarities of thesis-antithesis constitute the cyclical dimension of change. However, such cycles are never closed, as they would be in a circle. When a circle is opened a bit, it does not return precisely to its starting point. As a consequence, with the continuation of activity, the open cycle forms a spiral (the synthesis or integration). With the repetition of spirals, a direction is formed (see Overton 1994a, 1994c).

In the nineteenth century, the principle of Becoming was extended in the works of social theorists such as Comte, Marx, and Spencer and in the writings of biologists such as Wolff, Goethe, and von Baer. And James Mark Baldwin (1895, 1897/1973) first formulated a developmental psychology specifically in terms of dialectical categories. As Broughton (1981) points out, "his [Baldwin's] . . . orientation came to be tempered with a Hegelian view of dialectical progress through qualitatively distinct levels of consciousness" (p. 399; see also, Freeman-Moir, 1982).

In the twentieth century, Heinz Werner (1948, 1957) drew his own theoretical approach from the dialectical feature of the principle of Becoming. In this context, he proposed the orthogenetic (normal development) principle as a universal explanatory principle, or law, of transformational change. The *orthogenetic principle* asserts that "whenever there is development it proceeds from an initial state of relative globality and lack of differentiation to a state of increasing differentiation, articulation, and hierarchic integration" (1957, p. 126). But Werner was not alone among twentieth-century developmentalists in constructing metatheoretical and theoretical understandings framed by the dialectic of Becoming. Piaget, for example, draws from the same image in laying out the metatheoretical grounding for his "*equilibration*" explanation of human transformational development: "These global transformations . . . gradually denote a sort of law of evolution which can be phrased as follows: assimilation and accommodation proceed from a state of chaotic undifferentiation to a state of differentiation with correlative coordination" (Piaget, 1954, p. 352). Similarly, Vygotsky (1978) maintains that development is best characterized as "a complex dialectical process characterized by periodicity, unevenness in the development of different functions, metamorphosis or qualitative transformation of one form into another" (p. 73).

It is significant also that these three major developmentalists of the last half of the twentieth century—Piaget (Piaget & Garcia, 1991, p. 8), Werner (Werner & Kaplan, 1963, p. 11) and Vygotsky (1978) all considered development to be change entailing a spirality that emerges from cycles and yields direction (see Figure 2.6). As Vygotsky noted specifically with respect to higher psychological functions, "Development, as often happens, proceeds here not in a circle but in a spiral, passing through the same point at each new revolution while advancing to a higher level" (p. 56).

Along with classical developmental theorists like Werner, Piaget, and Vygotsky, dynamic theorists, both from the British object-relations (e.g., Fairbairn, 1952; Winnicott, 1965) and the ego psychology schools (Erikson, 1968) have found the core dialectical Becoming notions of "activity," "differentiation," and "integration" central for understanding both normal and pathological human ontogenesis (Overton & Horowitz, 1991).

This discussion has focused on the historical impact of the Leibnizian-Hegelian tradition as it advanced and articulated the principle of Becoming. More broadly, the philosophical grounding of the relational developmental tradition was progressively elaborated from Leibniz to Kant to Hegel, and it was Kant's own contribution that simultaneously both advanced and retarded this process. Kant's line of sight was epistemological, and because knowing is a human activity, his focus was on the human conditions necessary for knowledge. Hume, after splitting reason (mind) from observation, had come to argue that valid (universal and necessary) knowledge cannot be found in the observational world, which yields only the particular and the contingent. Kant agreed, but adopting a relational stance, he argued that this fact does not lead to the dismissal of valid knowledge. Rather, it simply demonstrates that if contingent knowledge is a feature of the observational world, then valid knowledge must be a feature of thought, of mind.

Kant

Arguing from the relational perspective, Kant maintained that both valid and contingent knowledge are essential aspects of human experience (i.e., both the universal and the particular, the necessary and the contingent are features of human experience). Consequently, the question was not—as assumed in the

Newtonian-Humean split tradition—whether it was possible to have valid knowledge. The central question became the conditions of mind that had to be assumed to produce the experienced valid knowledge. Kant began the description of these conditions with the presupposition that reason-thought-concepts form a relational matrix with observation-intuitions-perceptions. This affirmation of the Leibnizian relational tradition—itself often described as Kant's (1781/1966) attempt to reconcile rationalism and empiricism—is nowhere better articulated than in the famous relational aphorism ascribed to him: "Concepts without percepts are empty, percepts without concepts are blind." This often repeated aphorism is a variant of Kant's actual "Thoughts without contents are empty, intuitions without concepts are blind. . . . The understanding cannot see, the senses cannot think. By their union only can knowledge be produced" (p. 45).

From this overarching relational commitment, Kant presented a philosophical sketch of human cognition that further affirmed both the activity and organization features of the Becoming tradition. Kant's description of mind basically entailed three interrelated dynamic system components. Because Kant did not split structure and function, these dynamic systems are sometimes examined from the structural perspective and are called "faculties" and "forms." At other times, they are examined from the functional perspective and called "powers" or "activities": First, sense data or content is transformed into *a priori* categories of space and time according to the *forms of intuition* or forms of perception. Second, perceptions become synthesized in terms of *a priori categories of understanding*. The categories of understanding (e.g., existence, reality, causality, necessity) operate as a base level rule system that orders percepts according to the very features that Hume had dismissed (e.g., necessity, causality, reality, existence). Third, the *imaginative faculty* characterizes the activity of mind as it functions to synthesize perceptions and categories into objects of knowledge; "There exists therefore in us an active power for the synthesis of the manifold which we call imagination. . . . This imagination is meant to change the manifold of intuition into an image" (1781/1966, p. 112).

In addition to these three basic components of mind, Kant described a faculty of "judgment." Judgment is the active process that applies knowledge—gained through intuition, understanding, and imagination—to the practical world. This scheme of the relation between knowledge and the accessing and application of that knowledge became the background for a later cognitive developmental distinction between the development of a cognitive competence and the development of procedures for accessing and applying that competence (Chandler & Chapman, 1994; Overton 1990, 1991a; Overton & Dick, in press).

Kant and the Phenomena-Noumena Split

Although this sketch of human cognition is grounded in the relational, two additional features of Kant's position are inconsistent with the relational developmental tradition: Kant's Cartesian split of phenomena and noumena, and that Kant considered the categories and forms of intuition to be fundamentally unchanging. *Noumena* were described as "things-in-themselves," or objects and events independent of any representation of the object or event. *Phenomena* were described as representations of objects and events as they are known by the knower. For Kant, these spheres were split. The thing-in-itself was disconnected from knowing, and knowing was disconnected from the thing-in-itself. A direct consequence of this split is that the (person) point of view became a privileged position, in the same way that the Newtonian-Humean tradition had made the point of view a privileged position.

One broad impact of this Kantian split for developmental inquiry is that it came to form the background logic for the nativist side of the nature-nurture debate, just as the Newtonian-Humean split formed the background logic for the nurture side. This nativism—whether with respect to Chomskyian (1975) explanations of language (see Jackendoff, 1994; Overton, 1994b; Pinker, 1997), or with respect to other contemporary forms of neo-nativism (e.g., Astuti, Solomon, Carey, 2004; Baillargeon, 1993; Karmiloff-Smith, 1991; J. M. Mandler, 1992; Spelke & Newport, 1998)—presents a picture of the human mind as a set of innate rules, untouched by history and culture; an inversion of the empiricist tradition, which presents a picture of history and culture, untouched by the human mind.

Hegel's Relational Developmental Reconciliation of Mind and Nature

Hegel resolved Kant's split and moved his static categories back into a more fully coherent relational developmental context. Hegel (1807, Introduction) began his work from the position that there could be no detached thing-in-itself, just as there could be no detached knowing-in-itself. Rather, the world of knowing and

the world of actual objects operated within the same dialectical relational matrix as other fundamental categories. This is the meaning of his well-known relational aphorism: "What is reasonable [the known] is actual [the object] and what is actual is reasonable" (Hegel, 1830, p. 9). Like Kant and others who held this line of thought, Hegel took the a subject, person centered, or phenomenological point of view. However, for Hegel, the world of actual objects and events became a dialectical feature of this perspective.

In his *phenomenology* (i.e., the study of experience) of mind (i.e., of the subject), Hegel distinguished two features or "moments" of consciousness: (1) the *moment of knowledge* (i.e., knowing, thinking, "notion") and (2) the *moment of truth* (i.e., the actual or object). At any point, these moments may not stand in a harmonious relationship, as when what one thinks to be the case (moment of knowledge) turns out to be in error with respect to the actual world (moment of truth). In this dialectic history comes to play a central role, and knowledge becomes developmental, as when there is a lack of correspondence between these two moments then "consciousness must alter its knowledge to make it conform to the object" (Hegel, 1807, p. 54). Thus, while Kant maintained that knowing is action that remains static in its form, Hegel held knowing to be action that transforms itself across time.

In Hegel, the Kantian stable and fixed features of mind became fluid and changing, or as Hundert (1989) points out, Kant's metaphor of mind as "a steel filing cabinet" became replaced by a metaphor of organic growth. This metaphor of organic growth then assumes the position as background that sustains and promotes future thinking from a relational-developmental perspective. The metaphor is evident in the relational concepts of "differentiation" and "integration" that emerge from the dialectic, and Hegel's description of the development of knowledge that he presents in the first pages of his *Phenomenology,* stands as a prototype for the developmental organic vision:

> The bud disappears in the bursting-forth of the blossom, and one might say that the former is refuted by the latter; similarly, when the fruit appears, the blossom is shown up in its turn as a false manifestation of the plant, and the fruit now emerges as the truth instead. These forms are not just distinguished from one another, they also supplant one another as mutually incompatible. Yet at the same time their fluid nature makes them moments of an organic unity in which they not only do not conflict, but in which each is as necessary as the other; and this mutual necessity alone constitutes the life of the whole. (Hegel, 1807, p. 2)

The Hegelian image of growth according to active processes of system differentiation and integration contrasts sharply with the Kantian image of fixed, *a priori* given active systems. A number of contemporary domains of developmental inquiry reflect the legacy of these traditions. For example, the Kantian metaphor of mind as a fixed "steel filing cabinet" provides background support for contemporary approaches to developmental inquiry that offer the digital computer as their guiding model of the nature of mind. The computer image itself fixes an understanding of the nature of cognitive-affective processes, change, and persons. The reality that emerges from this metaphor portrays cognitive development as either a simple increase in representational content (Scholnick & Cookson, 1994), which this machine "processes," through various linear causal mechanisms, or as an increase in the efficiency of the computational machinery itself (Siegler, 1989, 1996; Sternberg, 1984). In this picture, there is no room for the expressive-transformational change found in the works of Hegelian oriented investigators such as Piaget, Werner, Erikson, Bowlby, and others

The Kantian-Hegelian contrast also grounds and sustains an important debate in the domain of affective development among those who begin from a shared understanding that "emotions are not 'stimuli' or 'responses' but central, organizing features of personality and behavior" (Malatesta, Culver, Tesman, & Shepard, 1989, p. 5). Moving from this shared subject or person centered point of view that takes expressive change as the domain of developmental inquiry, a Kantian group (e.g., Ekman, 1984; Izard, 1977; Izard and Malatesta, 1987) and a Hegelian group (e.g., Lewis 1993; Sroufe, 1979) set off on different paths concerning how best to characterize the affective development of the child. The Kantians argue for the adequacy of models that describe the infant as having a number of "discrete" basic emotions innately available. The Hegelians argue that a more adequate description suggests that the infant begins affective life—as well as social and cognitive life—as a relatively undifferentiated action system that becomes differentiated and reintegrated through operating on the actual world. Malatesta et al. (1989) capture the psychological translation of the Hegelian framework with respect to Sroufe's work: "Affects begin as undifferentiated precursor states of distress and nondistress

and differentiate into specific emotions only gradually. Differentiation occurs in a stage-like way as a function of major developmental reorganizations" (p. 11).

The debate over the form of emotional development is paralleled by a debate about the nature of the relationship between cognitive and emotional development. This debate is also framed by split and relational positions. The split positions assert that conceptual boundaries are cuts of nature. The relational developmental position understands them as moments of functioning. As Santostefano (1995) points out, "Cognition and emotion will remain segregated as long as investigators view the boundary as real and the domains as opposites, either independent of each other (e.g., Zajonc, Pietromonaco, & Bargh, 1982), parallel and interacting with one another (e.g., Leventhal, 1982) or with one dominating the other (e.g., Izard, 1982; G. Mandler, 1982)" (p. 63).

Phenomenological Constructivism and Realism

The Hegelian reconciliation of mind and nature established the conceptual base for a particular type of constructivism that is probably best referred to as phenomenological constructivism. *Constructivism* is broadly the position that the activity of mind necessarily participates in the construction of the *known* world. Constructivism is an epistemological position that affirms the necessity of the constitutive dimension of the person in *all* knowing. Constructivism is usually contrasted with *Realism,* which is the epistemological claim that the world as known is a direct reflection of a mind-independent world. For the realist, perception of this world is direct, without the mediating activity of mind (see, for example, Gibson, 1966, 1979). *Phenomenological constructivism* is the position that the mind constructs the world as known, but the known world is a co-actor in the process of construction. Following Hegel, there are alternative object worlds, and it is important to be explicit about whether inquiry is focusing on the subject's object world—inquiry explores phenomenological constructivism—or the physical-cultural object world—inquiry explores implications of the settings within which phenomenological constructivism occurs. Hilary Putnam (1987) clearly captures the sense of phenomenological constructivism: "My view is not a view in which the mind makes up the world. . . . If one must use metaphorical language, then let the metaphor be this: the mind and the world jointly make up the mind and the world" (p. 1). Phenomenological constructivism best characterizes Piaget's (1992) writings, as he suggests when he declares himself, "neither empiricist nor a priorist but rather constructivist or partisan of dialectic as a source of novelties" (p. 215).

Object relations as a family of theories of human development, along with Erikson's ego theory and the cognitive-affective theories of Piaget and Werner, all focus their inquiry on the psychological development of the individual or the person. However, phenomenological constructivist inquiry may take as its point of view either this constructive process or the correlation between this process and cultural-biological objects. Thus, within phenomenological constructivism, as within the broader relational framework, theories of *intrapsychic* development and theories of *interpersonal* development do not necessarily conflict. Consider, Piagetian intrapsychic and Vygotskyian interpersonal approaches to development. The development of individual intrapsychic dynamic organizations has been the Piagetian focus of inquiry, but a good deal of Piaget's own investigations concerned the role of the interpersonal-cultural context (Carpendale & Mueller, 2004; Overton, 2004b; Piaget, 1995; Youniss & Damon, 1992). The sociocultural interpersonal process has been the Vygotskian focus; yet, Vygotsky's writings demonstrate a significant interest in intrapsychic dynamic organizations of the person. van der Veer and Valsiner (1994) argue that it is inaccurate to depict Piaget and Vygotsky as irreconcilable opponents, as Piaget and Vygotsky did not differ about the development of "personal-cognitive (and affective) structures" (p. 6) and there is an "actual closeness of the basic personalistic (i.e., person centered) standpoints of both . . . [that] has gone without attention" (p. 6). As a consequence of both their reciprocal interests and their metatheoretical closeness, Piaget and Vygotsky can reasonably be offered as alternative poles of a broadly unified approach to developmental inquiry: Piaget's intrapsychic inquiry functions in the context of the Vygotskian interpersonal action, as Vygotsky's interpersonal inquiry functions in the context of the Piagetian intrapsychic action.

Hermeneutics: Gadamer and the Relational Developmental Tradition

Hans-Georg Gadamer (1976, 1989, 1993) in Europe, along Charles Taylor (1979, 1985, 1991, 1995) in North America, illustrate contemporary forms of the Leibnizian-Hegelian relational developmental philosophical tradition. Although both Gadamer and Taylor

reject features of the Hegelian system (e.g., the dogmatic notion that history must proceed according to the dialectic), each draws from and extends Hegel's notions of the relational, the developmental, and the centrality of action as both expressive-constitutive and instrumental-communicative. Both also contributed to an understanding of the centrality of embodiment; Gadamer in his existential grounding of the hermeneutic and Taylor in his explicit discussions of embodiment.

Broadly, hermeneutics is the theory or philosophy of the interpretation of meaning. Its heritage goes back to a classical period when the hermeneutic task involved the discovery of the meaning of sacred texts. Schleiermacher made important formative contributions during the Romantic period. Vico and Droysen later added a historical dimension to the problem of interpretation, and Dilthey, in his *Critique of Historical Reason* at the turn of the twentieth century developed the method of *verstehen* (understanding) as a methodology for the human sciences (Bleicher, 1980).

Gadamer's hermeneutic approach has been labeled "universal hermeneutics" or "philosophical hermeneutics" (as distinct from Habermas's "critical hermeneutics" to be discussed in a later section). As heir of the hermeneutic tradition, Gadamer (1989) elaborates upon the method of *verstehen* (see the relational developmental methodology section of this chapter), but it goes beyond a methodology to present a broad philosophical position that seeks to answer the question: "How is understanding possible?"

The Hermeneutic Circle: Transformational Change. The *hermeneutic circle*—a reaffirmation of the Leibnizian-Hegelian holism of the unity of parts to whole—constitutes the *fundamental background condition for all understanding* from a hermeneutic point of view. Understanding moves forward from preunderstanding to understanding in a circular movement. The whole—whether a text that requires understanding, or some general phenomenon of inquiry, such as human development—is initially approached with the meanings, or "prejudices" that constitute common sense. These are the initial meanings of what hermeneutics terms the *preunderstanding*. These anticipatory meanings—called *the horizon of a particular present* (Gadamer, 1989, p. 306)—are projected onto the phenomenon of inquiry. As a consequent, they form an early stage in understanding. However, the object of inquiry is not merely a figment of projection but is itself an internally coherent whole; thus, the object of inquiry reciprocally operates as a corrective source of further projections of meaning. Through this circle of projection and correction understanding advances, and the notion of an advance or progression is appropriate here because the hermeneutic circle is never a closed circle, and represents—following Hegel's dialectic—the open *cycle* whose action creates a continuing directional spirality to knowing. "The circle is constantly expanding, since the concept of the whole is relative, and being integrated in ever larger contexts always affects the understanding of the individual part" (Gadamer, 1989, p. 190).

The hermeneutic circle has formed the conceptual context for several features of developmental inquiry. When inquiry is focused on the transformational nature of ontogenetic change, the hermeneutic circle becomes the conceptual context for the Piagetian theory of assimilation-accommodation, as the action mechanism of change. *Assimilation* constitutes the projection of expressive meanings (i.e., affects, perceptions, cognitions) onto a world being constituted. *Accommodation* constitutes the action of correction, as assimilation yields partial success-partial failure. Psychological development necessarily proceeds from some organization (sensory motor, representational, reflective) that constitutes preunderstanding, and this is projected to constitute the world as experienced. But this projection meets the demands of a world with its own structure, and action corrects itself in anticipation of further projection.

When inquiry is focused on defining the *scientific nature* of developmental inquiry, then the hermeneutic circle articulates the relational scientific logic called "abduction" or "retroduction." This concept and its place in a relational metamethod will be detailed in the methodology section of this chapter.

In claiming the hermeneutic circle as the core precondition for understanding, Gadamer follows Heidegger, by grounding the concept in the existential world (1989, p. 293). Through this grounding (a) epistemology and ontology are joined as relative moments in the whole of understanding, and (b) understanding is identified as both relational (the reciprocity of the interpreter and tradition) and variational-transformational (the oscillating movement of part and whole leads to changes in the form of the individual and tradition).

The hermeneutic circle, as the precondition for understanding, owes an obvious debt to the Leibnizian-Hegelian holistic tradition. Gadamer acknowledges this debt, and identifies himself as "an heir of Hegel." However, this kinship is defined most significantly when Gadamer articulates the specific conditions for under-

standing; for here he endorses the Hegelian "dialectic of the universal and concrete as the summation of the whole of metaphysics" (Gadamer, 1993, p. 51).

The preservation and renewal of the dialectic of universal and concrete—the transcendental and the immanent—defines the core of Gadamer's approach. Here *universal and concrete stand in a dialectic relationship,* an identity of opposites. Each is granted an ontological reality.

The Marxist Split Tradition

Karl Marx was an early admirer of Hegel and an heir to the Leibnizian-Hegelian tradition. His work affirmed the centrality of both activity and the dialectic. However, and most importantly, Marx elevated the material world to an absolute privileged position as *the* source of thought. In this move, Marx reasserted a split tradition. Marx's *dialectical materialism* thus became another foundationalist position similar to the Newtonian-Humean tradition in that both appeal to a mind-independent material world as the absolute bedrock of the Real.

Social and Biological Constructivism

The Marxist split tradition became the ground for a second type of constructivism, *social constructivism.* If the material world is elevated to a privileged ontological status, then this world of instrumental-communicative social relations, and *only* this world, provides the base for building the categories of thought. Once the categories of thought are acquired from the split-off social world, the person projects these socially instilled categories back onto the world, and, in this sense, constructs the known world. Hence, social constructivism is the constructing of the known world from an instrumental-communicative social relations foundation and *only* from this foundation. This position was later elaborated by the pragmatist George Herbert Mead under the rubric of "social behaviorism" (Mead, 1934). Vygotsky, who was writing at about the same time as Mead, has come to be viewed as the father of the social constructivist movement—probably because Vygotsky's writings were initially "discovered and propagated by small groups of 'progressive' young Marxists who saw his work as providing, among other things, a foundation for a criticism of the prevailing tendency to attribute individual failure and success to genetic endowment" (van der Veer & Valsiner, 1994, p. 5).

When Vygotsky is placed in a social constructivist framework, there is no rapprochement between he and Piaget—between the interpersonal and the intrapsychic. When located in this frame, his work becomes more closely aligned with the Gibsonian (Gibson, 1966, 1979) realist ecological position. In this context, the person's "intentions" become reduced to instrumental acts that change through a Darwinian-like selection process in accordance with the affordances of the environment for action (Reed, 1993; Rogoff, 1993).

Social constructivism, as a split position, tends to not even address phenomenological constructivism. Instead, social constructivism places itself in a dichotomous, either/or relationship with yet a third variety of constructivism, *biological constructivism.* Biological constructivism emerges from the Kantian split. It involves the claim that the person cognitively-affectively constructs the world as known, but that genetic endowment determines the fundamental nature of the person who does the constructing. Scarr (1992) nicely illustrates biological constructivism. She maintains, on the one hand, that "reality" is constructed by experience, and thus, it is "not a property of a physical world" (p. 50). On the other hand, she asserts that "*genotypes drive experiences.* . . . In this model, parental genes determine their phenotypes, the child's genes determine his or her phenotype, and the child's environment is merely a reflection of the characteristics of both parents and child" (p. 54). The biological and social constructivist confrontation, as it turns out, is yet another manifestation of the split nature-nurture dichotomy.

The Marxist split tradition has continued to exert a strong contextual influence over both the interpretation of Vygotsky's approach, and, more broadly, the interpretation of the relationship between the intrapsychic and the interpersonal. The Marxist tradition has been elaborated, and these elaborations often function as the epistemological-ontological ground for conceptualizing the interpersonal and social-cultural features of development. Jurgen Habermas's "critical theory" represents the most carefully and fully articulated contemporary elaboration of the Marxist split tradition.

Habermas and the Marxist Split Tradition

In a negative sense, the core of Habermas's work is the denial of any possible centrality of the expressive-constitutive subject as a point of reference. As McCarthy points out, "the key to Habermas's approach is his rejection of the 'paradigm of consciousness' and its associated 'philosophy of the subject' in favor of the through-and-through intersubjectivist paradigm of 'communicative' action" (1993, p. x). Habermas himself

considers this move to an exclusive privileging of the instrumental-communicative to be a "paradigm-change," which leaves behind any vestige of Cartesian "subjectivism" or "metaphysics of subjectivity" (Habermas, 1993b, p. 296). From this position, Habermas (1991, 1992) analyzes favorably George Herbert Mead's "social behaviorism" as furthering the same paradigm shift, and he attacks "the moral point of view" taken by expressive-constitutive oriented developmental investigators such as Kohlberg because here "issues of moral cognition take precedence over questions of practical orientation" (1993a, p. 121).

In a more positive vein, Habermas attempts to locate all the traditional dialectical tensions between subject-object, self-other, and reason- observation *within* the domain of communication and social practice (McCarthy, 1991). If this conceptualization functioned as a point of view thereby allowing another point of view that located the same tensions within the expressive-constitutive subject, it would constitute a powerful perspective from which to explore the instrumental-communicative features of development. However, Habermas insists that the dialectical tensions *must be located in the instrumental-communicative realm, and only in the instrumental-communicative realm.* This insistence on exclusivity, undercuts the potential of the position by perpetuating a split that ultimately unnecessarily constrains developmental inquiry.

Culture and Development in Split and Relational Metatheories

The Marxist split tradition has, in recent times, been an influential background for the study of culture and development. Wertsch (1991) highlights this in his "cultural" approach to development. He begins his broadly synthetic account by setting a contrast between developmental inquiry that focuses on "the universals of mental functioning" and his own focus on "sociocultural specifics." However, rather than continuing this contrast of the universal and the particular—the transcendent and the immanent—in a relational context, Wertsch explicitly establishes the Marxist ontological agenda, and casts Vygotsky and Luria solidly in this tradition, by stating:

> In pursuing a line of reasoning that reflected their concern with Marxist claims about the *primacy of social forces* [emphasis added], Vygotsky and his colleagues . . . contended that many of the design features of mediational means [instrumental activity] originated in social life. As stated by Luria (1981), "in order to explain the highly complex forms of human consciousness one must go beyond the human organism. One must seek the origins of conscious activity and 'categorical' behavior not in the recesses of the human brain or in the depths of the spirit, but in the external conditions of life. Above all, this means that one must seek these origins in the external processes of social life, in the social and historical forms of human existence" (p. 25). (Wertsch, 1991, p. 33–34)

The Marxist split tradition then becomes the bridge between Vygotsky and M. M. Bakhtin (1986) whose contribution was a conception of meaning and language that is thoroughly external to the expressive-constitutive subject (Kent, 1991), as follows:

> Both Vygotsky and Bakhtin believed that human communicative practices give rise to mental functioning in the individual. . . . They were convinced that "the social dimension of consciousness is primary in time and in fact. The individual dimension of consciousness is derivative and secondary" (Vygotsky, 1979, p. 30). (Wertsch, 1991, p. 13)

However, in Wertsch's estimation Vygotsky failed to sufficiently pursue the Marxist tradition, for given that Vygotsky was "interested in formulating a Marxist psychology, he made precious little mention of broader historical, institutional, or cultural processes" (1991, p. 46). Consequently, Wertsch draws on Habermas's (1984) account of instrumental-communicative action, and moves beyond Vygotsky to Bahktin's contribution, to pursue the general claim that "mediational means emerge in response to a wide range of social forces" (1991, p. 34).

Shweder's (1990) approach to culture and development is another contemporary illustration of the background influence of the Marxist split tradition (see also Cole, 1995, 1996; Miller, 1996; Rogoff, 1990, 1993). However, in proposing an outline for a "cultural psychology," he follows a more Habermas-like strategy by locating the dialectic tension of subject and culture necessarily in the realm of instrumental, thereby denying any reality to the fully embodied expressive subject. In Shweder's presentation, the universal, the transcendent, the ideal, and the fixed are explicitly denied any fundamental reality (1990, p. 25); thus, a dichotomy is established that privileges the particular, the immanent, the practical, and the relative. As a result, when Shweder (Shweder & Sullivan, 1990) identifies the subject or person of his subject-culture inquiry, it explicitly is not, nor could it be, the universal or ideal subject

found in some domains of cognitive-affective and personality research. Shweder explicitly excludes this subject, and instead offers the "semiotic subject" characterized by instrumental rationality and instrumental intentionality only. The final result is little different than a straight forward Skinnerian (1971) position or frame in which it is permissible to consider "higher mental processes" only to the extent that they are understood as being defined by a specific repertoire of instrumental responses correlated with specific stimuli. Similarly, for Shweder, "rationality" and "intentions" are defined as instrumental problem solving behaviors that are correlated with cultural contexts.

When the Marxist tradition is the ground for developmental inquiry, as in these illustrative examples, activity is central—as action is central in the Leibnizian-Hegelian relational tradition. However, it is important to keep in focus the fact that activity, in the Marxist tradition, is necessarily restricted to the instrumental-communicative. When Rogoff (1993) discusses cognition—as Sweder discusses intentions or Bakhtin discusses language and meaning—it becomes restrictively defined as "the active process of solving mental and other problems" (p. 124). The Leibnizian-Hegelian tradition accepts both this instrumental action, and expressive mental action as relational moments. But when Rogoff addresses the expressive, she first reframes it as a static formulation and then rejects it as a "cognition as a collection of mental possessions" (p. 124). The result of splitting off the expressive subject, is that Rogoff's own "relational" approach is a relation between the instrumental-communicative subject and cultural contexts. This she presents as an approach, which permits the consideration of "individual thinking or cultural functioning as foreground without assuming that they are actually separate elements" (p. 124). This is correct, but the assumption of "separate elements" has already been made in the background, and the unwanted element of this assumption has already been suppressed.

The expressive-instrumental Leibnizian-Hegelian tradition of the centrality of action is illustrated in a number of action theories that focus on the role of culture in human development (see Oppenheimer, 1991 for a review). However, a particularly rich account is found in the work of E. E. Boesch (1991). As Eckensberger (1989) points out:

> Bosech begins with the notion that any action and any goal has two dimensions or aspects: one . . . is *the instrumental aspect,* that an action is carried out instrumentally in order to reach a goal. For example, one takes a hammer to drive a nail into the wall. There is, however, a second aspect in any action, which Boesch calls the *subjective-functional aspect* [the expressive-constitutive]. Here, the driving of the nail may have the subjective-functional meaning that one feels proud of being able to do so, one may also enjoy it, or it may even be related to feelings of rage. In any case, the action of nailing receives a meaning beyond its instrumental purpose. (p. 30)

From this base, Boesch (1980, 1991, 1992) and Eckensberger (1989, 1990, 1996) formulate the beginnings of a developmentally oriented cultural psychology that is more inclusive than those founded in the Marxist tradition. Boesch's system and Eckensberger's extension of this system draw from Piaget—whom Boesch calls the first action theorist—as well as from Janet's dynamic theory, psychodynamic theory, and Kurt Lewin's field-theory. Elaborating on the relational theme of expressive-constitutive/instrumental-communicative action they argue for a cultural psychology that aims at an integration of "cultural and individual change . . . individual and collective meaning systems . . . [and one that] should try to bridge the gap between objectivism and subjectivism" (Eckensberger, 1990).

Inclusive relational developmental models of the individual and culture are not limited to the European continent. For example, as described earlier, Damon (1988, 1991; Damon & Hart, 1988), presents the outline of just such an approach in his discussion of "two complementary developmental functions, . . . the social and the personality functions of social development" (1988, p. 3). Moving within the broader Leibnizian-Hegelian concepts of differentiation and integration, Damon presents the interpenetration of the two functions as an identity of opposites. Furth (1969), also explicitly presented a relational view of social development in which "self and other as isolated entities are denied in favor of relations" (Youniss, 1978, p. 245), and this perspective has been the continuing focus of Youniss and his colleagues (e.g., Davidson & Youniss, 1995; Youniss & Damon, 1992). This relational perspective has most recently been expanded in the literature on infant development (Mueller & Carpendale, 2004; Hobson, 2002) through a focus on the contrast between individualist (split) and relational approaches to the origin and nature of social development:

> The basic tenet of the relational framework is that the self always already lives within a social world and is always already immersed in relations with other. These relations

> are not established in the mind of the individual, but in common space through interaction and dialogue. . . . Neither self nor other are primary. Rather self and other are sustained by particular interactive relations, and it is within and through these relations that concepts of self and other evolve. (Mueller & Carpendale, 2004, p. 219)

Pragmatism

A final epistemological-ontological tradition that requires a brief exploration to establish a grounding for an inclusive understanding of development is the American pragmatism of Pierce, James, and Dewey. Pragmatism's fundamental postulates cohere as a contextualist worldview (Pepper, 1942) that draws on many Leibnizian-Hegelian themes, including holism, action, change, and the dialectic. The focus of these themes is located on the *instrumental* rather than the expressive pole of the relational dialectic. If Gadamer and Taylor (see also Ricoeur, 1991) can be said to represent the phenomenological perspective of the relational developmental philosophical grounding, then pragmatism, particularly the work of James and Dewey, can be read as representing the instrumental perspective.

Putnam (1995) describes *holism* as one of the chief characteristics of James' philosophy. This holistic commitment leads to an "obvious if implicit rejection of many familiar dualisms: fact, value, and theory are all seen by James as interpenetrating and interdependent" (p. 7). James (1975) addresses virtually all the traditional dichotomies of split-off traditions, and he, along with Dewey (1925), argue for a relational interpenetrating understanding of universal-particular, inner-outer, subject-object, theory-practice, monism-pluralism, and unity-diversity. Although affirming the ontological reality of the dialectic of interpenetration, the stress and the focus of pragmatism is, however, on the particular, the outer, object, practice, pluralism, and diversity.

Epistemologically, pragmatism repudiates the foundationalism of an ultimate fixed object of knowledge, and insists on the connection of knowledge and action. Knowledge arises out of action, out of particular practices or *praxis*. In this respect, James and Dewey differ little from Habermas, Gadamer, Bahktin, and Taylor. Rather than specifically elaborating the notion of dialogue as the mediator of knowing (expressive and instrumental), the concept of experience carries this function in pragmatism. Experience manifests its relational dialectical as well as its embodied character in being what James terms a "double-barrelled" (1912, p. 10) concept. "It recognizes in its primary integrity no division between act and material, subject and object, but contains them both in an unanalyzed totality" (Dewey, 1925, pp. 10–11). *Experience* refers to *both* the action of the subject (i.e., the subject's embodied active exploration, active manipulation, and active observation of the object world) *and* the object world's active impingement on the subject. "It includes *what* men do and suffer, *what* they strive for . . . and endure, and also *how* men act and are acted upon" (p. 10). For purposes of empirical investigation, analysis separates this integrity into two points of view, and hence two different analytic meanings. However, the empirical question is not whether experience is truly one or the other. The question is how each form of experience contributes to the understanding of human development.

Change and novelty are also basic to the pragmatists position. However, the focus of change in pragmatism is on the variational rather than transformational. Similarly, novelty is the new variant rather than the emergent level of organization found in transformational change. This focus is due in part to pragmatism's Darwinian evolutionary commitment ("Darwin opened our minds to the power of chance-happenings to bring forth fit results if only they have time to add themselves together," James, 1975, p. 57) along with the commitment to the joint relation of the instrumental and adaptation.

Pragmatism's focus on variational change and variational novelty, also follow from a preference for pluralism and diversity over unity (James, 1975, p. 79). In the discourse of pragmatism, and especially in James' writings, concepts of "unity," "order," "form," and "pattern" tend to be interpreted as denoting the fixed and unchanging, in the sense of an Absolute Transcendentalism (James, 1975, p. 280) or an essentialism. When this is the horizon of understanding, change in fact necessarily becomes restricted to the sphere of diversity. If it is only in the sphere of diversity and pluralism that there is "some separation among things, . . . some free play of parts on one another, some real novelty or chance" (p. 78), then change must be restricted to this sphere. For pragmatism, it is in the sphere of pluralism and diversity that "the world is still in process of making" (p. 289).

The suggestion, that pragmatism can be read as representing the instrumental perspective of the relational developmental philosophical grounding falters upon this restrictive identification of unity with the static and fixed, and of diversity with the active and changing. In

the broad relational developmental tradition, activity and change are not split off and thus encapsulated. Unity and synonyms of unity—including "the universal," "the transcendent," "order," "system," "form," "pattern," "organization," and "structure"—have been understood throughout the Leibnizian-Hegelian tradition as ontologically active and changing. As emphasized throughout this chapter, the Leibnizian-Hegelian tradition grants the same ontological reality to diversity and synonyms of diversity—including "the concrete," the "immanent," "disorder," "plurality," "content," and "function." From the expressive and transformational point of view within this tradition, structures function (act) and change and self-organizing systems operate (act) and change. From the instrumental and variational point of view within this tradition, action is variational (diversity, plurality, and individual differences) and changing.

A related problem concerns the ambivalent posture that pragmatism takes toward the notion of order or unity itself. If implicit, in the writing of the pragmatists, it is clear, and explicit, in Stephen Pepper's (1942) distillation of the presuppositions of the pragmatists that disorder or diversity is a fundamental category of pragmatism-contextualism. However, because pragmatism offers itself as not denying any category that has a practical value ("I call pragmatism a mediator and reconciler. . . . She has in fact no prejudices whatever," James, 1975, p. 43), it cannot deny order, unity, organization, pattern, or structure. Pragmatism does, however, approach these concepts from a certain distance and distrust. Most important, in some readings pragmatism tends to interpret order and unity as an end to be attained, rather than as a legitimate ontological real. In this case, order is *treated,* if not directly conceptualized, as Appearance. Such a reading of pragmatism splits the dialectical relation between the transcendent and the immanent or unity and diversity found in both Gadamer and Taylor. When this split occurs, pragmatism takes on the flattened character suggested in the postmodern approach of Richard Rorty. As the philosopher Thomas McCarthy (1991) points out, "Rorty's epistemological behaviorism is a variant of the contextualism common to most postmodernist thinkers" (p. 20). It entails "a radically contextualist account [that] . . . amounts to flattening out our notions of reason and truth by removing any air of transcendence from them" (p. 14–15).

This split reading of pragmatism is not necessarily canonical however. Pepper, in a work following his well-known *World Hypotheses,* acknowledges the significance of *integration* in contextualism. He argues relationally that the integration the pragmatist should stress "is an integration of conflicts" (1979, p. 411); hence, a dialectical integration. He also warns the contextualist against the danger of an overemphasis on the contingent, the accidental, and the variable. For Pepper, the contextualist has been "so impressed with evidences of historical change and cultural influences and the shifting contexts of value that he cannot easily bring himself to accept any degree of permanence" (p. 414). Pepper chides the constricted contextualist by arguing that "there is much more permanence in the world than the contextualist admits" (p. 414). Similarly, Hilary Putnam has elaborated an extensive contemporary relational reading of pragmatism. Putnam sometimes refers to this reading as "internal realism" and sometimes as "pragmatic realism" (1987, 1990, 1995). In either case, the—"realism" is the commonsense realism discussed earlier—neither the Realism of mind (idealism), nor the Realism of world (materialism). The "internal" and "pragmatic" features of his system assert the position of a pragmatism that includes both the expressive and the instrumental.

Finally, that pragmatism need not be read as a split tradition, which suppresses order and change of form, can even be gleaned from the writings of one of the founders of pragmatism:

> There is in nature . . . something more than mere flux and change. Form is arrived at whenever a stable, even though moving, equilibrium is reached. Changes interlock and sustain one another. Whenever there is this coherence there is endurance. Order is not imposed from without but is made out of the relations of harmonious interactions that energies bear to one another. Because it is active . . . order itself develops. It comes to include within its balanced movement a greater variety of changes. (Dewey, 1934, p. 14)

If pragmatism is read as joining order to disorder, and joining activity and change to both structure and function as this quote from Dewey and the work of Putnam and others suggest, then pragmatism enlarges the philosophical grounding of the relational developmental tradition, and it enlarges the field of developmental inquiry. Illustrations of the impact of this expanded grounding of pragmatism are found, for example, in Damon and Hart (1988) with respect to social development, Nucci (1996) on moral development, and in the works of Varela et al. (1991) and Wapner and Demick

(1998) for cognitive development. Piaget (1985)—considering the relation between his earlier investigations of operational knowing (expressive-transformational) and contemporary explorations of procedural knowing (instrumental-variational)—found in this new arena "a possible synthesis of genetic structuralism, the focus of all of our previous work, with the functionalism found in the work of J. Dewey and of E. Claparede" (p. 68).

The aim of this section has been to establish a broad epistemological-ontological grounding for an inclusive understanding of development as formal (transformational) and functional (variational) changes in the expressive-constitutive and instrumental-communicative features of behavior. This has been done by following the historical thread of the Leibnizian-Hegelian tradition and noting the locations where this thread splits-off toward exclusivity. Ultimately, the illustrations given do not aim to categorize particular writings. Rather, they suggest the consequences that follow for the domain of developmental inquiry when a particular path is taken. In the concluding section, the epistemological-ontological grounding, the relational developmental metatheory, developmental systems, developmentally oriented embodied action metatheory and the integrative concept of development become the interwoven context for a discussion of the nature of the scientific understanding and explanation of developmental phenomena. This section centers on issues of methodology, where methodology is understood broadly as metamethods for empirical scientific inquiry. Methods, in the narrow sense of specific techniques for designing, conducting, and evaluating empirical research, are considered within the context of alternative methodologies.

In an important sense, the discussion to the present point has constructed our developmental landscape, and populated it with certain types of psychological subjects (expressive-instrumental), who change in certain ways (transformationally-variationally), and act in a biological-cultural world that both creates and is created by them. Now, the task is to inquire into how best to investigate the changing character of these persons and this world. This is the task of methodology.

METHODOLOGY: EXPLANATION AND UNDERSTANDING

The focus to this point has been developmental inquiry as a broad-based knowledge-building activity. Now, we turn more specifically to developmental psychology as an empirical science. The historical dialogue has arrived at a common agreement that whatever else it may be, any empirical science is a human activity—an epistemological activity—with certain broad orientations and aims. The historical dialogue has further led to common agreement that the most general aim and orientation of empirical science is the establishment of a *systematic* body of knowledge that is tied to observational evidence (Lakatos 1978b; Laudan 1977; Nagel, 1979; Wartofsky, 1968). Any empirical science aims at building a *system* of knowledge that represents *patterns* of relations among phenomena and processes of the experienced world. These patterns constitute explanations of the phenomena and processes under consideration. Further, to be properly empirical, the explanations must have implications that are *in some sense* open to observational-experimental assessment.

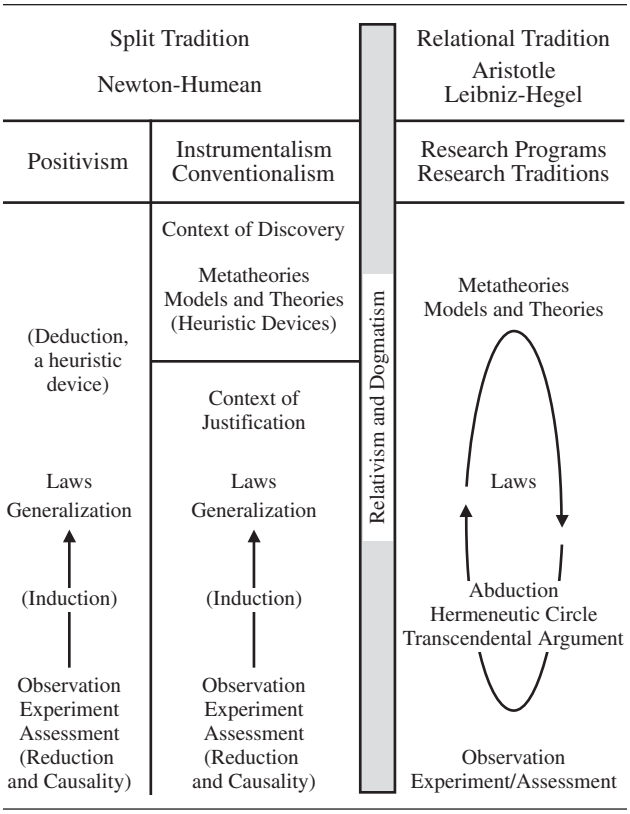
If science aims toward order, it begins in the flux and chaos of the everyday experience that is often termed common sense (see earlier discussion of commonsense level of observation, Figure 2.1, and see also, Nagel, 1967, 1979; Overton, 1991c; Pepper, 1942; Wartofsky, 1968). As the philosopher Ernst Nagel (1967) has described it, "All scientific inquiry takes its departure from commonsense beliefs and distinctions, and eventually supports its findings by falling back on common sense" (p. 6). This commonsense base is what Gadamer refers to as the "anticipatory meanings" of preunderstanding (see earlier discussion of the hermeneutic circle).

For the science of developmental psychology, this starting point includes actions that are commonly referred to as perceiving, thinking, feeling, relating, remembering, valuing, intending, playing, creating, languaging, comparing, reasoning, wishing, willing, judging, and so on. These actions, and the change of these actions, as understood on a commonsense level of experience or discourse (see Figure 2.1), constitute the problems of developmental psychology. They are problems because, although they represent the stability of practical everyday life, even the most meager reflection reveals they appear as inconsistent, contradictory, and muddled. Refined, critically reflective theories and metatheories, including systems, embodiment, cultural, biological, information processing, Piagetian, Gibsonian, Vygotskian, Eriksonian, Chomskyian and the rest, all represent attempts to explain (i.e., to bring order into) the contradictory, inconsistent, muddled features of these various domains of inquiry.

There is little disagreement among scientists, historians of science, and philosophers of science about where science begins—in common sense and the contradictions that show up when we begin to examine common sense—and where it leads—to refined theories and laws that explain. Science is a human knowledge building activity designed to bring *order and organization into the flux of everyday experience.* Disagreement emerges only when the question is raised of exactly how, or by what route, science moves from common sense to refined knowledge. *This issue—the route from common sense to science—constitutes the methodology of science.* Historically, two routes have been proposed, and traveled. One emerges from the Newtonian-Humean split epistemological-ontological tradition. Those who follow this route are directed to avoid interpretation, and to carefully walk the path of observation and *only* observation. On this path, reason enters *only* as an analytic heuristic; a tool for overcoming conflicts by generating ever more pristine observations, free from interpretation. The second route emerges from the Leibnizian-Hegelian relational tradition. Those who follow this route are directed toward a relational dialectical path on which interpretation and observation interpenetrate and form an identity of opposites. On this path, interpretation and observation, become co-equal complementary partners in conflict resolution.

The following discussion discusses these two pathways (see Overton 1998 for a more extensive historical discussion). We begin from the Newtonian split tradition of mechanical explanation and move to a contemporary relational methodology. This evolution of these scientific methodologies including the empiricist variants of positivism, neopositivism, instrumentalism, and conventionalism as well as relational metamethod is outlined in Table 2.1.

TABLE 2.1 Scientific Methodologies



Split Mechanical Explanation

Mechanical explanation continues the splitting process by dichotomizing science into two airtight compartments, *description and explanation.* There are three steps to mechanical explanation. The first is considered descriptive and the second two are considered explanatory.

Step 1: Reduction Description

The first step of mechanical explanation entails addressing the commonsense object of inquiry and *reducing* it to the absolute material, objective, fixed, unchanging, foundational elements or atoms, that are, in principle, directly observable. Terms like *reductionism, atomism, elementarism, and analytic attitude,* all identify this step. In psychology, for many years the atoms were "stimuli" and "responses." Today, they tend to be "neurons" and "behaviors" or "contextual factors" and "behaviors" or "inputs" and "outputs"—the story line changes, but the themes remain the same within this metamethod. In keeping with the framework of empiricism and materialism, the broad stricture here is to ultimately reduce all phenomena to the visible.

Briefly, consider one impact of this first step on developmental inquiry. Immediately, "transformational change," "stages" of development, and the "mental organizations," or "dynamic systems" that change during development become suspect as being somehow derivative because they are not directly observable. At best under this storyline, transformations, stages, and mental organization can only function as summary statements for an underlying more molecular really Real. The drive throughout this step is toward the ever more molecular in the belief that it is only in the realm of the molecular

that the Real is directly observed. This is particularly well illustrated in the recent enthusiasm for a "microgenetic" method (e.g., D. Kuhn et al., 1995; Siegler, 1996) as a method that offers "a *direct* means for studying cognitive development" (Siegler & Crowley, 1991, p. 606, emphasis added). In this approach an intensive "trial-by-trial analysis" reduces the very notion of development to a molecular bedrock of visible behavioral *differences* as they appear across learning trials.

It is important to recognize that the aim of Step 1 is to drive out interpretations from the commonsense phenomena under investigation. Under the objectivist theme, commonsense observation is error laden, and it is only through ever more careful *neutral* observation that science can eliminate this error, and ultimately arrive at the elementary bedrock that constitutes the level of "facts" or "data" (i.e., invariable observations).

Step 2: Causal Explanation

Step 2 of mechanical explanation begins to move inquiry into the second compartment of compartmentalized science—*explanation.* Step 2 consists of the instruction to find the invariant relations among the elements described in Step 1. More specifically, given our objects of study in developmental psychology—behavior and behavior change—this step directs inquiry to locate antecedents. These antecedents, when they meet certain criteria of necessity and sufficiency, are termed "causes" and *the discovery of cause defines explanation within this metamethod.* The antecedents are also often referred to as *mechanisms,* but the meaning is identical.

This is another point at which to pause and notice an important impact of metatheory. Because of the particular metatheoretical principles involved, the word "explanation" comes to be defined as an antecedent-consequent relation, or the efficient-material proximal cause of the object of inquiry. Further, science itself comes to be defined as the (causal) explanation of natural phenomena. It is critically important to remember here that Aristotle had earlier produced a very different metatheoretical story of scientific explanation. Aristotle's schema entailed *complementary relations* among four types of explanation rather than a splitting. Two of Aristotle's explanations were causal in nature (i.e., antecedent material and efficient causes). Two, however, were explanations according to the pattern, organization, or form of the object of inquiry. Aristotle's "formal" (i.e., the momentary pattern, form or organization of the object of inquiry) and "final" (i.e., the end or goal of the object of inquiry) explanations were explanations that made the object of inquiry *intelligible* and gave *reasons* for the nature and functioning of the object (Randall, 1960; Taylor, 1995). Today, the structure of the atom, the structure of DNA, the structure of the solar system, and the structure of the universe are all familiar examples of formal pattern principles drawn from the natural sciences. Kinship structures, mental structures, mental organization, dynamic systems, attachment behavior system, structures of language, ego and superego, dynamisms, schemes, operations, and cognitive structures are familiar examples of formal pattern principles drawn from the human sciences. Similarly, reference to the sequence and directionality found in the Second Law of Thermodynamics, self-organizing systems, the equilibration process or reflective abstraction, the orthogenetic principle, or a probabilistic epigenetic principle, are all examples of final pattern principles (Overton, 1994a).

Both formal and final pattern principles entail interpretations that make the phenomena under investigation intelligible. Both, within the Aristotelian *relational* scheme, constitute legitimate explanations. However, within the *split* story of mechanical explanation, as guided by reductionism and objectivism, formal and final principles completely lose any explanatory status; explanation is limited to *nothing but* observable efficient (i.e., the force that moves the object) and material (i.e., the material composition of the object) causes. At best, within the mechanical story, formal and final principles may reappear in the descriptive compartment as mere summary statements of the underlying molecular descriptive "Real" discussed in Step 1. In this way, transformational change and dynamic psychological systems become eliminated or marginalized as necessary features of developmental inquiry.

Step 3: Induction of Interpretation-Free Hypotheses, Theories, Laws

Step 3 of mechanical explanation installs *induction* as the foundational logic of science. Step 3 instructs the investigator that ultimate explanations in science must be found in fixed unchanging laws, and these must be inductively derived as *empirical generalizations* from the repeated pristine observations of cause-effect relations found in Step 2. Weak generalizations from Step 2 regularities constitute interpretation-free "hypotheses." Stronger generalizations constitute interpretation-free theoretical propositions. Theoretical propositions joined

as logical conjunctions (and connections) constitute interpretation-free theories. Laws represent the strongest and final inductions.

Deduction reenters this story of empirical science as a split-off heuristic method of moving from inductively derived hypotheses and theoretical propositions to further empirical observations. In twentieth-century neopositivism, a "hypothetico-deductive method" was introduced into the Newtonian empiricist metamethod but this it was simply another variation on the same theme. The hypothesis of "hypothetico" has nothing to do with interpretation, but is simply an empirical generalization driven by pristine data that then served as a major premise in a formal deductive argument. Similarly, when the mechanical explanation termed "instrumentalism" moved away from the hypothetico-deductive stance to the employment of models, models themselves functioned merely as the same type of interpretation-free heuristic devices (see Table 2.1).

Another important variation on this same theme was the so-called covering law model of scientific explanation. This was introduced as a part of neopositivism by Carl Hempel (1942) and became the prototype of all later explanations formulated within this metatheory. According to the covering law model, scientific explanation takes a deductive (i.e., formal) logical form; particular events are explained when they are logically subsumed under a universal law or law-like statement (i.e., a highly confirmed *inductive empirical generalization*; Ayer, 1970; Hempel, 1942). The covering law model was particularly important for developmental inquiry because it treated historical events as analogous to physical events in the sense that earlier events were considered the causal antecedents of later events (Ricoeur, 1984).

Here, then, is the basic outline of the quest for absolute certainty according to the Newtonian and later empiricist stories of scientific methodology: Step 1, reduce to the objective (interpretation-free) observable foundation. Step 2, find the causes. Step 3, induce the law. As noted, variations appear throughout history. In fact, it would be misleading not to acknowledge that "probability" has replaced "certainty" as the favored *lexical item* in the story as it is told today. Induction is itself statistical and probabilistic in nature; however, this change represents a change in style more than substance, as the aim remains to move toward 100% probability, thereby arriving at certainty or its closest approximation. This type of fallibilistic stance continues to pit doubt against certainty as competing alternatives rather than understanding doubt and certainty as a dialectical relation, framed by the concept of *plausibility*.

Positivism and Neopositivism

Since its origin in the eighteenth century, mechanical explanation has been codified in several forms as specific methodologies or metamethods. Each of these represents a variation on the theme, but none of them have changed the basic theme itself. In the middle of the nineteenth century, mechanical explanation began to be formalized into a general strategy designed to demarcate empirical science from nonscience. It was at this time that the "age of metaphysics" came to an end. The ending was defined by philosophy's turning away from imperialistic dogmatic applications of broad philosophical systems, and directing its reflections toward what were called the "positive" sciences. Auguste Comte, writing a history of philosophy at the time, coined the term "positivism" when he described a division of three ages of thought: an early theological age, a metaphysical age that was just passing, and an age of positive science (see Gadamer, 1993; Schlick, 1991). The positive sciences were understood as those that located inquiry in the "given" or "positive." This positive sphere was identified as the sphere of "experience" rather than a sphere of the transcendental *a priori.* However, under the continuing influence of the "silent" metaphysics of the Newtonian-Humean tradition of empiricism and materialism, the "given" of experience became defined, not as commonsense observations or a commonsense level of discourse, but as observations that had been purified (i.e., reduced) of all interpretative features (i.e., reduced to "data" and more specifically, a type of data termed "sense data"). Thus, the positive sciences came to be those that were grounded in the Newtonian methodology, and positivism came to consist of the rules that further codified that methodology (see Table 2.1).

Following Comte, positivism was articulated across the remainder of the nineteenth century and into the early twentieth century by John Stuart Mill, Richard Avenarius, and Ernst Mach. In the 1920s and 1930s, what came to be termed neopositivism assumed a new posture in the philosophical work of the Vienna Circle, composed of such principal figures as Moritz Schlick, Rudolf Carnap, Herbert Feigl, Gustav Bergmann, Otto Neurath, Kurt Godel, and A. J. Ayer (see Smith, 1986). This "logical" positivism—which Schlick preferred to call "consistent empiricism" (1991, p. 54)—grew in the

context of the legacy of the Newtonian-Humean tradition that was now coming to be called analytic philosophy. At this point, analytic philosophy was taking its "linguistic turn" away from traditional epistemological questions of how the Real is known and replacing these with questions of what it means to make the language claim that the Real is known. In this context, logical positivism concerned itself not with knowing the Real but with the nature of statements that claim to know the Real (Schlick, 1991, p. 40).

Logical positivism focused on the reductionist and inductive features of Newtonian mechanical methodology. These were presented as the descriptive features of science, and as they go hand in hand with (causal) explanation as formulated in the covering law model, science from a positivist point of view is often characterized as the *description and explanation of phenomena.* This reductionistic focus ultimately led to the articulation of two complementary criteria for the demarcation of science from nonscience (Lakatos, 1978a, 1978b; Overton, 1984). First, a proposition (e.g., a hypothesis, a theoretical statement, a law) was acceptable as scientifically meaningful *if, and only if,* it could be reduced to words whose meaning could be directly observed and pointed to. "The meaning of the word must ultimately be *shown,* it has to be *given.* This takes place through an act of pointing or showing" (Schlick, 1991, p. 40). The words "whose meaning could be directly observed" constituted a *neutral observation language*—completely objective and free from subjective or mind-dependent interpretation. Thus, all theoretical language required reduction to pristine observations and a neutral observational language. Second, a statement was acceptable as scientifically meaningful *if, and only if,* it could be shown to be a strictly inductive generalization, drawn directly from the pristine observations. Thus, to be scientifically meaningful, any universal propositions (e.g., hypotheses, theories, laws) had to be demonstrably nothing more than summary statements of the pristine observations themselves (see Table 2.1).

Although logical positivism was formulated primarily within the natural sciences, its tenets were exported into behavioral science through Bridgman's (1927) "operationalism." The reductionism of positivism culminated in A. J. Ayer's (1946) "Principle of Verifiability." According to this principle, a statement is scientifically meaningful to the extent that, in principle, there is the possibility of direct experience (pristine observation) that will verify or falsify it. Bridgman's operationalism extended this principle by not only setting the criteria of scientific meaning, but also identifying the specific nature of this meaning: Within operationalism, the meaning of a scientific concept resides in the application of the concept (i.e., in the definition of the concept in operational or application terms).

Neopositivism reached its zenith in the 1940s and 1950s, but ultimately both the friends and the foes of positivism recognized its failure as a broad demarcationist strategy. It failed for several reasons:

1. It became clear, as demonstrated in the work of Quine (1953) and others (e.g., Lakatos, 1978b; Popper, 1959; Putnam, 1983), that rich theories are not reducible to a neutral observational language.
2. There was a demonstrated inadequacy of induction as the method for arriving at theoretical propositions (Hanson 1958, 1970; Lakatos, 1978a; Popper, 1959).
3. It became evident that the covering law model that it introduced was highly restricted in its application (Ricoeur, 1984) and faulty in its logic (Popper, 1959).
4. It was recognized that there are theories that warrant the attribution "scientific" despite the fact that they lead to no testable predictions (Putnam, 1983; Toulmin, 1961).

Instrumentalism-Conventionalism

With the failure of neopositivism, there arose out of the Newtonian-Humean tradition a revised methodology called *instrumentalism* or *conventionalism* (Lakatos, 1978b; Laudan, 1984; Kaplan 1964; Overton, 1984; Pepper, 1942; Popper, 1959). This demarcationist strategy accepted the failure of reductive-inductive features of positivism and admitted the introduction of theoretical interpretation as an irreducible dimension of science (see Table 2.1). However, metatheories, theories, and models were treated as mere *convenient or instrumental heuristic devices for making predictions.* Thus, theories in instrumentalism were restricted to the same predictive function that formal deductive systems (the covering law model) performed in neopositivism. Popper (1959) added a unique dimension to instrumentalism through the claim that theories and models should become acceptable in the body of science, *if and only if,* they specify observational results that, if found, would disprove or falsify a theory.

Instrumentalism opened the door for interpretation to reenter science but hesitated in allowing it to become a full partner in the scientific process of building a systematic body of knowledge. The movement to a dialecti-

cally defined full partnership of interpretation and observation required a radical change; one that would (a) abandon the splitting and foundationalism that had established pristine observation as the exclusive final arbiter of truth and (b) free up the notion of scientific explanation that was fossilized by this splitting and foundationalism. This move to a Libnizian-Hegelian relational alternative path from common sense to refined scientific knowledge emerged in the 1950s and it continues to be articulated today.

The concepts that constitute this relational methodology arose from diverse narrative streams including analytic philosophy, the history and philosophy of the natural sciences, the philosophy of behavioral and social sciences, and hermeneutics. Despite their often complementary and reciprocally supportive nature these narratives have frequently failed to connect or enter into a common dialogue. Yet, their cumulative effect has been to forge at least the outline of an integrated story of scientific methodology that moves beyond the split Cartesian dichotomies of natural science versus social science and explanation versus understanding, observation versus interpretation, and theory versus data.

Here briefly are some of the central characters in the 1950s emergence of this new metamethod: The later Ludwig Wittgenstein (1958)—whose seminal book *Philosophical Investigations* was first published in 1953—represented analytic philosophy, and he was followed by his pupil Georg Henrik von Wright and later Hilary Putnam. Hans-Georg Gadamer (1989)—whose *Truth and Method* was first published in 1960—represented the hermeneutic tradition and later came Jurgen Habermas, Richard Bernstein, and Paul Ricoeur. Steven Toulmin (1953)—whose *Philosophy of Science* was published in 1953—and N. R. Hanson (1958)—whose *Patterns of Discovery* was published in 1958—represented the natural sciences. They were later followed by Thomas Kuhn, Imre Lakatos, Larry Laudan, and, most recently, Bruno Latour. Elizabeth Anscombe (1957)—whose *Intention* was published in 1957, as were William Dray's (1957) *Laws and Explanation in History,* and Charles Frankel's (1957) *Explanation and Interpretation in History,* represented the social sciences as did Peter Winch (1958) and Charles Taylor (1964).

Relational Scientific Methodology

The story of the development of an integrated relational methodology of the sciences is obviously detailed and complex (see Overton, 1998, 2002). I outline its main features by focusing primarily on some of the major contributions of several of these central figures. These include Wittgenstein (1958) and *Philosophical Investigations,* Gadamer (1989) and *Truth and Method,* Hanson (1958) and *Patterns of Discovery,* von Wright (1971) and *Explanation and Understanding,* and Ricoeur (1984) and *Time and Narrative.*

Wittgenstein and Gadamer provide the basic scaffolding for the construction of this relational methodology. Wittgenstein's fundamental contribution entailed opening the door to the recognition that it is a profound error to treat the activities of science as providing veridical descriptions of a foundational Real. More positively, Wittgenstein's contribution lies in his suggestion that science is the product of some of the same human actions that underlie the conceptual constructions of our "form of life" or our *lebenswelt.* Gadamer's contribution was a systematic demonstration that this move beyond objectivism and foundationalism did not necessitate a slide into relativism.

Hanson's (1958) analysis of the history of the physical sciences was significantly influenced by Toulmin and by the Wittgenstein of *Philosophical Investigations.* In this work, Hanson drew three conclusions about the actual practice of the physical sciences as distinct from the classical rules described by neopositivism and instrumentalism. Hanson's conclusions themselves articulate a blueprint for the new relational methodology. The conclusions were: (a) There is no absolute demarcation between interpretation and observation, or between theory and facts or data. This was captured in his now famous aphorism "all data are theory laden." (b) Scientific explanation consists of the discovery of patterns, as well as the discovery of causes (see also Toulmin, 1953, 1961). (c) The logic of science is neither a split-off deductive logic, nor a split-off inductive logic, but rather, the logic of science is abductive (retroductive) in nature.

Interpretation and Observation

Hanson's first conclusion, that "all data are theory-laden," became the core principle of the new relational methodology: If there is a relational reciprocity between observation and interpretation, then the analytic idea of reducing interpretation to a foundational observational level makes no sense. In place of the analytic reductionism described in Step 1 of mechanical explanation, relational methodology substitutes a complementarity of analysis and synthesis. Analysis and the analytic tools of empirical science are reaffirmed in this principle, but there is a proviso that it simultaneously be recognized

that the analytic moment always occurs in the context of a moment of synthesis, and that the analysis can neither eliminate nor marginalize synthesis.

This feature of the new relational methodology was further supported and extended by two features of Gadamer's "philosophical hermeneutics." The first was his insistence that the alternating to-and-fro motion exhibited in play presents a favorable ontological alternative to Cartesian foundationalism. It is this ontological theme of to-and-fro movement that grounds and sustains the relational methodology. As a consequence, scientific activity—regardless of whether that activity is in the natural or the behavioral or the social sciences—becomes grounded in the to-and-fro (Escherian left hand-right hand) movement of interpretation-observation.

Gadamer's second contribution consists of his articulation—following Heidegger—of the hermeneutic circle described earlier. In this articulation, the hermeneutic circle comes to describe the basic *form* of how interpretation and observation move to and fro; that is, the cycle that opens to a spiral describes the basic structure of the new scientific methodology.

Inquiry moves in a circular movement from phenomenological commonsense understanding of an object of inquiry to the highly reflective and organized knowledge that constitutes scientific knowledge. The whole—the general field of inquiry, such as human development—is initially approached with the meanings or "prejudices" that constitute both commonsense observations and background presuppositions including metatheoretical assumptions. These anticipatory meanings are projected onto the phenomenon of inquiry. As a consequent, they form an early stage in inquiry. However, the object of inquiry is not merely a figment of projection, but is itself an internally coherent whole; the object of inquiry reciprocally operates as a corrective source of further projections of meaning. In this circle, interpretation identifies what will ultimately count as observations, and observations determine what will count as interpretation. To paraphrase Kant, interpretation without observations is empty; observation without interpretation is blind.

Through this circle of projection (interpretation) and correction (observation; Escherian left hand-right hand) inquiry advances; the circle remains open and constitutes a spiral. It was the dialectic cycle of interpretation and observation that later grounded Thomas Kuhn's (1962, 1977) notion of interpretative *paradigms* in the natural sciences and Lakatos's (1978a, 1978b) and Laudan's (1977, 1984, 1996) later discussions of the centrality of ontological and epistemological background presuppositions in any *research program* or *research tradition* (see Table 2.1).

Causality and Action Patterns

Hanson's second conclusion—that pattern and cause have always operated as explanations in the physical sciences—subverts the split stories of a clear-cut line of demarcation between the natural and social sciences. If natural science inquiry has—throughout the modern period—centrally involved both pattern and causal explanation, then understanding and explanation need not be dichotomous competing alternatives. Pattern or action-pattern explanation (Aristotle's formal and final explanation), which entails intention and reasons, and, causal explanation (Aristotle's material and efficient explanation), which entails necessary and sufficient conditions, here become relational concepts (Escherian left hand-right hand). Explanation then—defined as "intelligible ordering" (Hanson, 1958)—becomes the superordinate concept that joins dynamic patterns and cause. In place of detached causes described in Step 2 of mechanical explanation, relational methodology thus substitutes this concept of intelligible ordering.

The challenge within this relational methodology is to establish a justifiable coordination of the two modes of explanation. Von Wright (1971) presents a richly detailed and complex effort in this direction, and Ricoeur (1984) later builds upon and expands this effort. Both focus on explanation in the behavioral and social sciences. Von Wright and Ricoeur each suggest that the coordination be made along the lines of an internal-external dimension. Internal here refers to the domain of the psychological person-agent or psychological action system. External refers to movements or states. Following from a critical distinction made earlier by Anscombe (1957), any given behavior can be considered internal under one description and external under another description. Thus, any specific behavior may be, to quote von Wright (1971) "intentionalistically understood as being an action or otherwise aiming at an achievement, *or* . . . as a 'purely natural' event, i.e. in the last resort, muscular activity" (p. 128).

Within this framework, causal explanations—understood as Humean causes defined by the logical independence or contingency relationship between cause and effect—account for external movements and states. Action-pattern explanation (i.e., action, action systems, intention, reason) accounts for the meaning of an act.

On a moment's reflection, the situation described here is quite clear. Imagine the following behavior of two figures: Figure A moves across a space and a part of Figure A comes into contact with Figure B. In this situation, we have states and movements, and causal explanation is quite appropriate. The intervening states that identify the movement can readily be considered a series of sufficient and necessary conditions leading to the last state in the series. This can be easily demonstrated via various experimental designs.

While this explanation could be satisfactory if the figures were inorganic objects, the situation changes when the figures are identified as persons. In this latter case, it is unlikely that you will be satisfied with the causal explanation because you have been given no real psychological sense of the meaning of these movements. If, however, after identifying the figures as people you further learn that the movement of Figure A to B is the action of a man who walks across the room and caresses his wife's cheek, explanation begins to operate in the context of action, intention, reasons, and broadly meaning. The two moments of explanation—causal explanation, on the one hand, and action-pattern explanation, on the other—explain different phenomena. They have distinct referents; *movement and states* in causal explanation and *meaning* in action-pattern explanation. Because they have different referents—different *explananda*—they are compatible. However, they don't replace each other. Action isn't a cause of movement, it is a part of movement. Cause cannot explain action, action is required to initiate movement.

There are a number of implications that can be drawn from this analysis of the coordination of explanatory types. One is that it demonstrates that, in principle, it is not possible to explain phenomena of consciousness via brain or neurobiological explanations. Consciousness is internal as defined above; consciousness is about psychological meaning and must be explained by actions-pattern explanation. The brain is external, it is about states and movements, not psychological meaning. Neurobiological causal explanation complements action-pattern explanation, but can never present "the mechanism" of consciousness.

A second important implication is that when one again considers the distinction between person-centered and variable inquiry, it becomes clear that action-pattern explanations are the focus of the former and causal-explanations the focus of the latter. Piaget's theory, for example, represents a person-centered theory. "Person" (child-adult), "agent" (system, i.e., the "epistemological subject"), "action," "embodiment," and "intention" are core concepts that identify Piaget's focus on development. Piaget implicitly recognized the coordination of explanatory types and focused his efforts on explanation via formal action-pattern (schemes, operations) and final action-pattern (the equilibration process, reflective abstraction). Many, if not all, of the misunderstandings of Piagetian theory that Lorenço and Machado (1996) have articulated are derived from the fact that attacks on Piaget theory have invariably come from those who remain locked into the neopositivist story of exclusive causal explanation.

There are other implications to be drawn from a relational coordination of explanatory types, but a most important question that arises is that of exactly how action pattern explanation is operationalized. Students from their first science courses are trained in experimental methods designed to sort out the causal status of variables. When it can be shown, under controlled conditions, that an added variable (antecedent, independent variable) reliably leads to the behavior of interest (consequent, dependent variable), this demonstrates that the variable is the sufficient cause of the event. This provides the rationale for training and enrichment experiments often found in developmental psychology. If it can be shown, under controlled conditions, that when a variable is subtracted or removed and the event does not occur, the variable is the necessary cause of the event. This provides the rationale for deprivation experiments. Correlations are also discussed in this context, and while it is made explicit that correlation isn't causation, the same message treats correlation as a step in the direction of causal explanation.

But inductees into scientific methods receive little instruction concerning action-pattern forms of explanation, except perhaps to be told from an implicit neopositivist or instrumentalist perspective that it would be inappropriate speculation. To understand how action-pattern explanations can be made in a legitimate scientific fashion, it is necessary to turn to Hanson's third conclusion about the actual operation of science.

Abduction-Transcendental Argument

Hanson concluded that neither split-off induction nor split-off deduction constitutes the logic of science. Each of these enters the operation of science, but Hanson argued that the overarching logic of scientific activity is abduction. Abduction (also called "retroduction") was originally described by the pragmatist philosopher Charles Sanders Pierce (1992). In a contemporary version

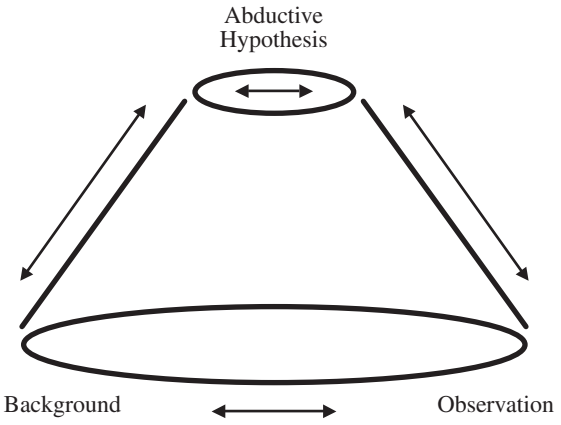


Figure 2.10 The abductive process.

this logic is termed "inference to the best explanation" (Fumerton, 1993; Harman, 1965). Abduction operates by arranging the observation under consideration and all background ideas (including all metatheoretical principles and theoretical models) as two Escherian hands (Figure 2.10). The possible coordination of the two is explored by asking the question of what, given the background ideas, must necessarily be assumed to have that observation. The inference to—or interpretation of—what must, in the context of background ideas, necessarily be assumed, then constitutes the explanation of the phenomenon. This explanation can then be assessed empirically to ensure its empirical validity (i.e., its empirical support and scope of application). An important relational feature of this logic is that it assumes the form of the familiar hermeneutic circle by moving from the phenomenological level (the commonsense object) to explanation and back in an ever-widening cycle that marks scientific progress (see Figure 2.11). The difference between this and the earlier described hypothetical-deductive explanation is that in abduction all background ideas, including metatheoretical assumptions, form a necessary feature of the process, and the abductive explanations themselves become a part of the ever widening corpus of background ideas.

The basic logic of abduction operates as follows:

1. Step 1 entails the description of some highly reliable phenomenological observation (O is the case).
2. For step 2, with O as the explanandum, an inference or interpretation is made to an action-pattern explanation (E). This results in the conditional proposition "If E is the case, then O is expected."
3. Step 3 entails the conclusion that E is indeed the case.

Examples of this abductive action-pattern explanation—or more specifically the one I describe next—are found

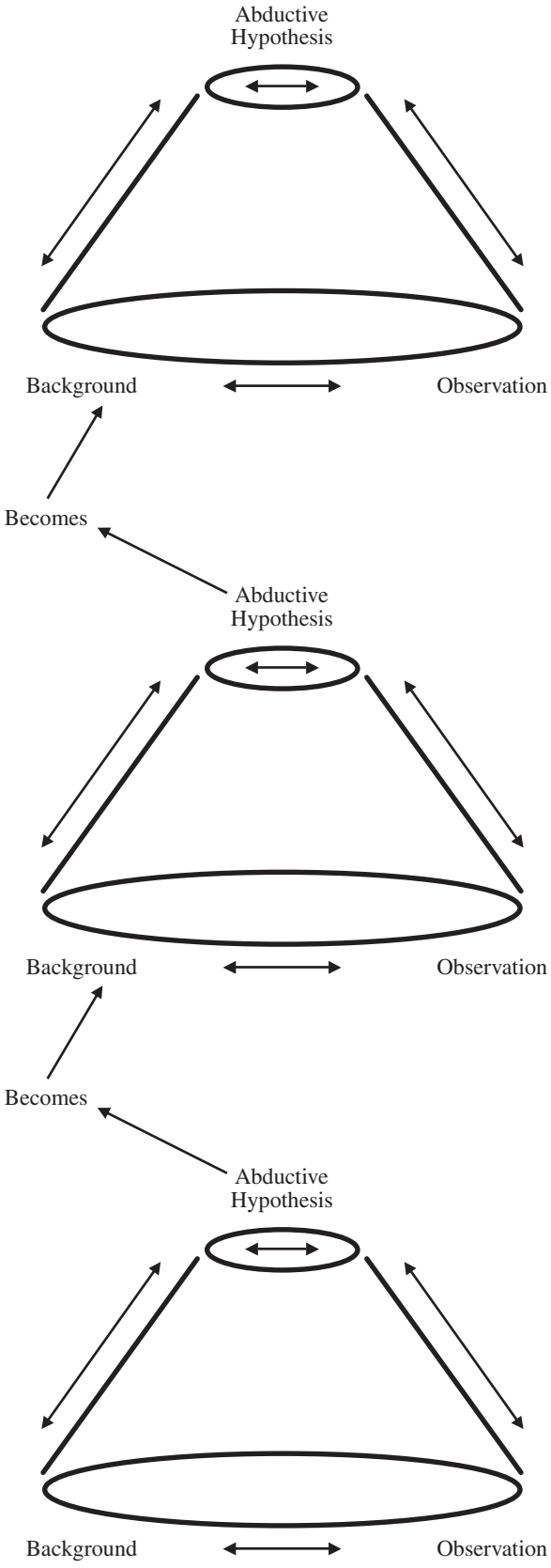


Figure 2.11 Scientific progress through abduction.

in virtually any psychological work that assumes a centrality of emotional, motivational, or cognitive mental organization. Piaget's work is particularly rich in abductive explanation. Consider the following example:

> There is the phenomenal observation (O) that it is the case that certain persons (i.e., children generally beyond the approximate age of 7 years) understand that concepts remain quantitatively invariant despite changes in qualitative appearances (conservation).
>
> Piaget then infers (E) a certain type of action system having specified features including reversibility (concrete operations). Thus, the conditional "If (E) concrete operations, then (O) conservation, is what would be expected."
>
> And the conclusion, given the O, "Therefore, concrete operations explains the understanding of conservation."

As Fumerton (1993) points out, it is obvious that if the conditional in Step 2 is read as material implication, the argument would be hopeless as it would then describe the fallacy of the affirmed consequent (i.e., the circle would be closed and it would represent a form of vicious circularity). Quite correctly, Fumerton recognizes that the "If . . . then" relation asserts some other sort of *connection.* Specifically, the connection is one of meaning "relevance" between E & O, where relevance is defined in terms of the intelligibility of the relation between E and O (Overton, 1990).

There must also be criteria established that would allow us to choose among alternative Es, the "best" E. But this is no major hurdle because many of the traditional criteria for theory or explanation *selection* that have been available can, with profit, be used here. These criteria include scope of the explanation; the explanation's depth, coherence, logical consistency; the extent to which the explanation reduces the proportion of unsolved to solved conceptual and/or empirical problems in a domain (Laudan, 1977); and the explanation's empirical support and empirical fruitfulness. Note here that scope, empirical support, and fruitfulness themselves bring the circle back to the observational world and thus keeps the cycle open. Action-pattern explanation or theory, in fact, determines what will count as further observations and the empirical task is to go into the world to discover whether we can find these observations. Thus, the cycle continually moves from commonsense observations and background presuppositions to action-pattern explanations, returning then to more highly refined observations and back again to explanation.

A form of abduction was brought to prominence by Kant and has recently been elaborated by Charles Taylor (1995; see also Grayling, 1993; Hundert, 1989) and used in the arena of cognitive development by Russell (1996). This is the *transcendental argument* and its form is:

1. (We) have a (reliable) phenomenological experience with characteristic *A*.

2. (We) could not have an experience with characteristic *A* unless mind has feature *B*.

3. *Therefore,* mind necessarily has feature *B*.

The transcendental argument is designed to answer the how possible questions (von Wright, 1971) with respect to consciousness or the organization of mind. Given some highly reliable phenomenological observation or phenomenological experience, like conservation, what must we necessarily assume (i.e., what kind of action-pattern explanation) about the nature of our consciousness or the nature of mind? What are the necessary conditions of intelligibility? Again, we begin with the explanandum, make a regressive argument to the effect that a stronger conclusion must be so if the observation about experience is to be possible (and being so, it must be possible). And this then leads to the stronger conclusion.

This then is the answer to the question of how one does pattern explanation in the behavioral and social sciences. The procedure for doing action-pattern explanation is found in abduction and the rules of the transcendental argument, and in the criteria that establish a particular abductive-transcendental explanation as the best or most plausible of alternative explanations. Rozeboom (1997) provides a richly detailed operational analysis of this process along with practical advice on statistical and research strategies associated with the process.

In conclusion, there is much more to the story of the new relational methodology. Much of this story is detailed in the elaboration of research methods and measurement models as the specific techniques for designing, conducting, and evaluating the empirical inquiry that adjudicates the best explanations, where these explanations may assume the various shapes of transformational, variational, expressive, instrumental, normative, and individual difference features of developmental change. The work of Rozeboom (1997) is an example, but there are a number of others who have been active in pursuing new tools for modeling and assessment of these diverse features of development. Even beginning to list these would be the work of a new chapter and, consequently, I mention only an excellent summary discussion of some of these new tools found in the work of Fischer and Dawson (2002).

Within this relational context, where interpretation and observation function as a complementary identity of

opposites, the broad issue of the validity of our scientific observations also becomes a central issue. Validity has always been a concern of scientific methodology, but in the split understanding of science, validity had nothing to do with interpreted meaning. In that story, validity became a content issue dependent to a great degree on the outcome of experimental design. In the relational story, the validity of our scientific observations, or what Messick (1995) terms "score validity," becomes a complementary process involving, on the one Escherian hand, the distinctive features of construct validity as it involves interpretative meaning, and, on the other Escherian hand, content validity as it involves denotative meaning (see Overton, 1998 for an extended discussion).

CONCLUSIONS

This chapter has explored background ideas that ground, constrain, and sustain theories and methods in psychology generally, and developmental psychology specifically. An understanding of these backgrounds presents the investigator with a rich set of concepts for the construction and assessment of psychological theories. An understanding of background ideas in the form of metatheories and metamethods also helps to prevent conceptual confusions that may ultimately lead to unproductive theories and unproductive methods of empirical inquiry. The ideas in the chapter are presented in the context of Hogan's (2001) earlier mentioned comment:

> Our training and core practices concern research methods; the discipline is . . . deeply skeptical of philosophy. We emphasize methods for the verification of hypotheses and minimize the analysis of the concepts entailed by the hypotheses. [But] all the empiricism in the world can't salvage a bad idea. (p. 27)

The ideas in this chapter are also presented in the service of ultimately proving wrong Wittgenstein's (1958) comment that "in psychology there are empirical methods and conceptual confusions" (p. xiv).

REFERENCES

Allport, G. (1955). *Becoming.* New Haven, CT: Yale University Press.

Anastasi, A. (1958). Heredity, environment, and the question "how?" *Psychological Review, 65,* 197–208.

Anscombe, G. E. M. (1957). *Intention.* Oxford, England: Basil Blackwell.

Appelbaum, M. I., & McCall, R. B. (1983). Design and analysis in developmental psychology. In W. Kessen (Ed.), *Handbook of child psychology* (Vol. 1, pp. 416–476). New York: Wiley.

Arsenio, W. F., & Lemerise, E. A. (2004). Aggression and moral development: Integrating social information processing and moral domain models. *Child Development, 75,* 987–1002.

Asendorpf, J. B., & Valsiner, J. (1992). Editors' introduction: Three dimensions of developmental perspectives. In J. B. Asendorpf & J. Valsiner (Eds.), *Stability and change in development: A study of methodological reasoning* (pp. ix–xxii). London: Sage.

Astuti, R., Solomon, G. E. A., & Carey, S. (2004). Constraints on conceptual development: A case study of the acquisition of folkbiological and folksociological knowledge in Madagascar. *Monographs of the Society for Research in Child Development, 69*(3, Serial No. 277).

Ayer, A. J. (1946). *Language, truth and logic* (2nd ed.). New York: Dover.

Ayer, A. J. (1970). What is a law of nature. In B. A. Brody (Ed.), *Readings in the philosophy of science* (pp. 39–54). Englewood Cliffs, NJ: Prentice-Hall.

Baillargeon, R. (1993). The object concept revisited: New directions in the investigation of infants' physical knowledge. In C. Granrud (Ed.), *Visual perception and cognition in infancy* (pp. 265–313). Hillsdale, NJ: Erlbaum.

Bakhtin, M. M. (1986). *Speech genres and other late essays* (C. Emerson & M. Holquist, Eds. & V. W. McGee, Trans.). Austin: University of Texas Press.

Baldwin, J. M. (1895). *Mental development in the child and the race: Methods and process.* New York: Macmillan.

Baldwin, J. M. (1973). *Social and ethical interpretations in mental development: A study in social psychology.* New York: Arno Press. (Original work published 1897)

Baldwin, J. M. (1976). *Development and evolution.* New York: AMS Press. (Original work published 1902)

Bateson, P. (1985). Problems and possibilities in fusing developmental and evolutionary thought. In G. Butterworth, J. Rutkowska, & M. Scaife (Eds.), *Evolution and developmental psychology* (pp. 3–21). New York: St. Martin's Press.

Belsky, J., Steinberg, L., & Draper, P. (1991). Childhood experience, interpersonal development, and reproductive strategy: An evolutionary theory of socialization. *Child Development, 62,* 647–670.

Bermudez, J. L. (1998). *The paradox of self-consciousness.* Cambridge, MA: MIT Press.

Bickhard, M. H. (1993). Representational content in humans and machines. *Journal of Experimental and Theoretical Artificial Intelligence, 5,* 285–333.

Bjorklund, D. F., & Pellegrini, A. D. (2002). *The origins of human nature: Evolutionary developmental psychology.* Washington, DC: American Psychological Association.

Bleicher, J. (1980). *Contemporary hermeneutics: Hermeneutics as method, philosophy and critique.* Boston: Routledge & Kegan Paul.

Block, J. (1971). *Lives through time.* Berkeley, CA: Bancroft.

Bloom, L. (1998). Language acquisition in its developmental context. In W. Damon (Editor-in-Chief) & D. Kuhn & R. Siegler (Vol. Eds.), *Handbook of child psychology: Vol. 2. Cognition, perception, and language* (5th ed., pp. 309–370). New York: Wiley.

Bloom, L., & Tinker, E. (2001). The intentionality model and language acquisition. *Monographs of the Society for Research in Child Development, 66*(1, Serial No. 267).

Boesch, E. E. (1980). *Kultur und handlung* [Culture and handling]. Bern: Huber.

Boesch, E. E. (1984). The development of affective schemata. *Human Development, 27,* 173–182.

Boesch, E. E. (1991). *Symbolic action theory and cultural psychology.* Berlin, Germany: Springer-Verlag.

Boesch, E. E. (1992). Culture: Individual—Culture: The cycle of knowledge. In M. V. Cranach, W. Doise, & G. Mugny (Eds.), *Social representations and the solid bases of knowledge* (pp. 89–95). Lewiston, NY: Hogrefe & Huber.

Bond, T. G., & Fox, C. M. (2001). *Applying the Rasch Model.* Mahwah, NJ: Erlbaum.

Bowlby, J. (1958). The nature of the child's tie to his mother. *International Journal of Psychoanalysis, 39,* 350–373.

Brandtstädter, J. (1998). Action perspectives on human development. In W. Damon (Editor-in-Chief), & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 807–863). New York: Wiley.

Brandtstädter, J., & Lerner, R. M. (Eds.). (1999). *Action and self-development: Theory and research through the life span.* London: Sage.

Brentano, F. (1973). *Psychology from an empirical standpoint* (A. C. Rancurello, D. B. Terrell, & L. McAlister, Trans.). London: Routledge.

Bridgman, P. (1927). *The logic of modern physics.* New York: Macmillan.

Bronfenbrenner, U. (1979). *The ecology of human development.* Cambridge, MA: Harvard University Press.

Bronfenbrenner, U., & Morris, P. A. (1998). The ecology of developmental processes. In W. Damon (Editor-in-Chief) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 993–1028). New York: Wiley.

Brooks, D. R. (1992). Incorporating origins into evolutionary theory. In F. J. Varela & J. Dupuy (Eds.), *Understanding origins: Contemporary views on the origin of life, mind and society.* Boston studies in the philosophy of science (Vol. 130, pp. 191–212). Boston: Kluwer Academic.

Brooks, D. R., & Wiley, E. O. (1991). *Evolution as entropy: Toward a unified theory of biology* (2nd ed.). Chicago: University of Chicago Press.

Broughton, J. M. (1981). The genetic psychology of James Mark Baldwin. *American Psychologist, 36,* 396–407.

Bunge, M. (1962). *Causality: The place of the causal principle in modern science.* New York: World Publishing.

Bunge, M., & Ardila, R. (1987). *Philosophy of science.* New York: Springer-Verlag.

Buss, D. M. (1999). *Evolutionary psychology: The new science of the mind.* Boston: Allyn & Bacon.

Cairns, R. B., Bergman, L. R., & Kagan, J. (Eds.). (1998). *The logic and implications of a person-oriented approach.* London: Sage.

Carpendale, J. I. M., & Mueller, U. (Eds.). (2004). *Social interaction and the development of knowledge.* Mahwah, NJ: Erlbaum.

Cassirer, E. (1951). *The philosophy of the enlightenment.* Boston: Beacon Press.

Chandler, M., & Chapman, M. (Eds.). (1994). *Criteria for competence: Controversies in the assessment of children's abilities.* Hillsdale, NJ: Erlbaum.

Chandler, M. J., Lalonde, C. E., Sokol, B. W., & Hallett, D. (2003). Personal persistence, identity development, and suicide. *Monographs of the Society for Research in Child Development, 68*(2, Serial No. 272).

Chomsky, N. (1975). Recent contributions to the theory of innate ideas. In S. P. Stich (Ed.), *Innate ideas.* Berkeley: University of California Press.

Cohen, M. R. (1931). *Reason and nature: An essay on the meaning of scientific method.* New York: Harcourt, Brace.

Cole, M. (1995). Culture and cognitive development: From cross-cultural research to creating systems of cultural mediation. *Culture and Psychology, 1,* 25–54.

Cole, M. (1996). *Cultural psychology: A once and future discipline.* Cambridge, MA: Harvard University Press.

Cole, M., & Wertsch, J. V. (1996). Beyond the individual-social antinomy in discussions of Piaget and Vygotsky. *Human Development, 39,* 250–256.

Collins, W. A., Maccoby, E. E., Steinberg, L., Hetherington, E. M., & Bornstein, M. H. (2000). Contemporary research on parenting: The case for nature and nurture. *American Psychologist, 55,* 218–232.

Cornford, F. M. (1937). *Plato's Cosmology.* London: Routledge & Kegan Paul.

Crick, N. R., & Dodge, K. A. (1994). A review and reformation of social-information processing mechanisms in children's development. *Psychological Bulletin, 115,* 74–101.

Csordas, T. J. (1999). Embodiment and cultural phenomenology. In G. Weiss & H. F. Haber (Eds.), *Embodiment: The intersection of nature and culture* (pp. 144–162). New York: Routledge.

Damasio, A. (1994). *Descartes' error: Emotion, reason, and the human brain.* New York: Avon Books.

Damasio, A. (1999). *The feeling of what happens: Body and emotion in the making of consciousness.* New York: Harcourt Brace.

Damon, W. (1988). Socialization and individuation. In G. Handel (Ed.), *Childhood socialization* (pp. 3–10). Hawthorne, NY: Aldine De Gruyter.

Damon, W. (1991). Problems of direction in socially shared cognition. In L. B. Resnick, J. M. Levine, & S. D. Teasley (Eds.), *Socially shared cognition* (pp. 384–397). Washington, DC: American Psychological Association.

Damon, W., & Hart, D. (1988). *Self-understanding in childhood and adolescence.* New York: Cambridge University Press.

Davidson, P., & Youniss, J. (1995). Moral development and social construction. In W. M. Kurtines & J. L. Gewirtz (Eds.), *Moral development: An introduction* (pp. 289–310). Boston: Allyn & Bacon.

Demetriou, A., & Raftopoulos, A. (2004). The shape and direction of development: Teleologically but erratically lifted up or timely harmonious? *Journal of Cognition and Development, 5,* 89–95.

Dennett, D. (1987). *The intentional stance.* Cambridge, MA: MIT Press.

Descartes, R. (1969). *The philosophical works of Descartes* (E. S. Haldane & G. R. T. Ross, Trans.). Cambridge, England: Cambridge University Press.

Dewey, J. (1925). *Experience and nature.* La Salle, Ill: Open Court Press.

Dewey, J. (1934). *Art as experience.* New York: Berkeley Publishing Group.

Dick, A. S., Overton, W. F., & Kovacs, S. L. (2005). The development of symbolic coordination: Representation of imagined objects, executive function and theory of mind. *Journal of Cognition and Development, 6,* 133–141.

Dodge, K. A. (1986). A social information processing model of social competence in children. In M. Perlmutter (Ed.), *Minnesota Symposia on Child Psychology* (Vol. 18, pp. 77–125). Hillsdale, NJ: Erlbaum.

Dodge, K. A., & Rabiner, D. L. (2004). Returning to roots: On social information processing and moral development. *Child Development, 75,* 1003–1008.

Dray, W. H. (1957). *Laws and explanation in history.* London: Oxford University Press.

Eckensberger, L. H. (1989). A bridge between theory and practice, between general laws and contexts? *Psychology and Developing Societies, 1,* 21–35.

Eckensberger, L. H. (1990). On the necessity of the culture concept in psychology: A view from cross-cultural psychology. In F. J. R. van de Vijver & G. J. M. Hutschemaekers (Eds.), *The investigation of culture: Current issues in cultural psychology* (pp. 153–183). Tilburg, Germany: Tilburg University Press.

Eckensberger, L. H. (1996). Agency, action and culture: Three basic concepts for psychology in general and for cross-cultural psychology in specific. In J. Pandey, D. Sinha, & D. P. S. Bhawuk (Eds.), *Asian contributions to cross-cultural psychology* (pp. 75–102). London: Sage.

Edelman, G. M. (1992). *Bright air, brilliant fire: On the matter of the mind.* New York: Basic Books.

Edelman, G. M., & Tononi, G. (2000). *A universe of consciousness: How matter becomes imagination.* New York: Basic Books.

Ekman, P. (1984). Expression and the nature of emotion. In K. Scherer & P. Ekman (Eds.), *Approaches to emotion* (pp. 329–343). Hillsdale, NJ: Erlbaum.

Elman, J. (2003). Development: It's about time. *Developmental Science, 6,* 430–433.

Erikson, E. H. (1968). *Identity youth and crisis.* New York: Norton.

Fairbairn, W. R. D. (1952). *An object-relations theory of the personality.* New York: Basic Books.

Fischer, K. W., & Dawson, T. L. (2002). A new kind of developmental science: Using models to integrate theory and research. *Monographs of the Society for Research in Child Development, 67*(1, Serial No. 268), 156–167.

Ford, D. H., & Lerner, R. M. (1992). *Developmental systems theory: An integrative approach.* Newbury Park, CA: Sage.

Frankel, C. (1957). Explanation and interpretation in history. *Philosophy of Science, 24,* 137–155.

Freeman-Moir, D. J. (1982). The origin of intelligence. In J. M. Broughton & D. J. Freeman-Moir (Eds.), *The cognitive developmental psychology of James Mark Baldwin: Current theory and research in genetic epistemology* (pp. 127–168). Norwood, NJ: Ablex.

Fumerton, R. (1993). Inference to the best explanation. In J. Dancy & E. Sosa (Eds.), *A companion to epistemology* (pp. 207–209). Cambridge, MA: Basil Blackwell.

Furth, H. G. (1969). *Piaget and knowledge: Theoretical foundations.* Englewood Cliffs, NJ: Prentice Hall.

Gadamer, H. G. (1976). *Hegel's dialectic: Five hermeneutic studies* (P. Christopher Smith, Trans.). New Haven, CT: Yale University Press.

Gadamer, H. G. (1989). *Truth and Method* (J. Weinsheimer & D. Marshall, Trans., 2nd ed. rev.). New York: Crossroad.

Gadamer, H. G. (1993). *Reason in the age of science.* Cambridge, MA: MIT Press.

Gallese, V. (2000a). The acting subject: Towards the neural basis of social cognition. In T. Metzinger (Ed.), *Neural correlates of consciousness* (pp. 325–334). Cambridge: MIT Press.

Gallese, V. (2000b). The "shared manifold hypothesis": From mirror neurons to empathy. *Journal of Consciousness Studies, 8,* 33–50.

Gelman, R., & Williams, E. M. (1998). Enabling constraints for cognitive development and learning: Domain specificity and epigenesis. In W. Damon (Editor-in-Chief) & D. Kuhn & R. Siegler (Vol. Eds.), *Handbook of child psychology: Vol. 2. Cognition, perception, and language* (5th ed., pp. 575–630). New York: Wiley.

Gergen, K. J. (1994). The communal creation of meaning. In W. F. Overton & D. S. Palermo (Eds.), *The nature and ontogenesis of meaning* (pp. 19–40). Hillsdale, NJ: Erlbaum.

Gibson, J. J. (1966). *The senses considered as perceptual systems.* Boston: Houghton-Mifflin.

Gibson, J. J. (1979). *The ecological approach to visual perception.* Boston: Houghton-Mifflin.

Gilbert, S. F. (2003). *Developmental biology* (7th ed.). Sunderland, MA: Sinauer Associates.

Gilbert, S. F., Opitz, J. M., & Raff, R. A. (1996). Resynthesizing evolutionary and developmental biology. *Developmental Biology, 173,* 357–372.

Gilovich, T., & Eibach, R. (2001). The fundamental attribution error where it really counts. *Psychological Inquiry, 12,* 23–26.

Goodwin, B. C. (1992). The evolution of generic forms. In F. J. Varela & J. Dupuy (Eds.), *Understanding origins: Contemporary views on the origin of life, mind and society* (Boston Studies in the Philosophy of Science, Vol. 130, pp. 213–226). Boston: Kluwer Academic.

Goodwyn, S. W., & Acredolo, L. P. (1993). Symbolic gesture versus word: Is there a modality advantage for onset of symbol use? *Child Development, 64,* 688–701.

Gottlieb, G. (1992). *Individual development and evolution: The genesis of novel behavior.* New York: Oxford University Press.

Gottlieb, G. (2002). Developmental-behavioral initiation of evolutionary change. *Psychological Review, 109,* 211–218.

Gottlieb, G., Wahlsten, D., & Lickliter, R. (1998). The significance of biology for human development: A developmental psychobiological systems view. In W. Damon (Editor-in-Chief) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 233–274). New York: Wiley.

Gould, S. J. (1986). Archetype and adaptation. *Natural History, 95*(10), 16–28.

Gould, S. J. (2000). More things in heaven and earth. In H. Rose & S. Rose (Eds.), *Alas, poor Darwin: Arguments against evolutionary psychology* (pp. 101–126). New York: Harmony Books.

Grayling, A. C. (1993). Transcendental arguments. In J. Dancy & E. Sosa (Eds.), *A companion to epistemology* (pp. 506–509). Cambridge, MA: Basil Blackwell.

Grotevant, H. D. (1998). Adolescent development in family contexts. In W. Damon (Editor-in-Chief) & N. Eisenberg (Vol. Ed.), *Handbook of child psychology: Vol. 3. Social, emotional, and personality development* (5th ed., pp. 1097–1149). New York: Wiley.

Habermas, J. (1984). *The theory of communicative action: Vol. 1. Reason and the rationalization of society* (T. McCarthy, Trans.). Boston: Beacon Press.

Habermas, J. (1991). The paradigm shift in Mead. In M. Aboulafia (Ed.), *Philosophy, social theory, and the thought of George Herbert Mead* (pp. 138–168). Albany: State University of New York Press.

Habermas, J. (1992). *Postmetaphysical thinking: Philosophical essays* (W. M. Hohengarten, Trans.). Cambridge, MA: MIT Press.

Habermas, J. (1993a). *Justification and application: Remarks on discourse ethics* (C. P. Cronin, Trans.). Cambridge, MA: MIT Press.

Habermas, J. (1993b). *The philosophical discourse of modernity: Twelve lectures* (F. G. Lawrence, Trans.). Cambridge, MA: MIT Press.

Halevy, E. (1955). *The growth of philosophic radicalism.* Boston: Beacon Press.

Hanson, N. R. (1958). *Patterns of discovery.* New York: Cambridge University Press.

Hanson, N. R. (1970). Is there a logic of scientific discovery. In B. A. Brody (Ed.), *Readings in the philosophy of science* (pp. 620–633). Englewood Cliffs, NJ: Prentice-Hall.

Harding, S. (1986). *The science question in feminism.* Ithaca, NY: Cornell University Press.

Harman, G. (1965). The inference to the best explanation. *Philosophical Review, 74,* 88–95.

Harré, R. (1995). The necessity of personhood as embodied being. *Theory & Psychology, 5,* 369–373.

Hart, D., Atkins, R., & Fegley, S. (2003). Personality and development in childhood: A person-centered approach. *Monographs of the Society for Research in Child Development, 67*(1, Serial No. 272).

Hegel, G. W. F. (1807). *Phenomenology of spirit* (A. V. Miller, Trans.). New York: Oxford University Press.

Hegel, G. W. F. (1830). *Hegel's logic: Being part one of the encyclopedia of the philosophical sciences* (W. Wallace, Trans.). New York: Oxford University Press.

Held, R., & Bossom, J. (1961). Neonatal deprivation and adult rearrangement: Complementary techniques for analyzing plastic sensory-motor coordinations. *Journal of Comparative Physiological Psychology, 54,* 33–37.

Held, R., & Hein, A. (1958). Adaptation of disarranged hand-eye coordination contingent upon re-afferent stimulation. *Perceptual-Motor Skills, 8,* 87–90.

Hempel, C. G. (1942). The function of general laws in history. *Journal of Philosophy, 39,* 35–48.

Hobson, R. P. (2002). *The cradle of thought.* London: Macmillan.

Hogan, R. (2001). Wittgenstein was right. *Psychological Inquiry, 12,* 27.

Hoppe-Graff, S. (1989). The study of transitions in development: Potentialities of the longitudinal approach. In A. Ribaupierre (Ed.), *Transition mechanisms in child development: The longitudinal perspective* (pp. 1–30). Cambridge, MA: Cambridge University Press.

Hundert, E. M. (1989). *Philosophy, psychiatry and neuroscience: Three approaches to the mind.* New York: Oxford University Press.

Ingold, T. (2000). Evolving skills. In H. Rose & S. Rose (Eds.), *Alas, poor Darwin: Arguments against evolutionary psychology* (pp. 273–297). New York: Harmony Books.

Izard, C. E. (1977). *Human emotions.* New York: Plenum Press.

Izard, C. E. (1982). Comments on emotions and cognition: Can there be a working relationship. In M. S. Clark & S. T. Fiske (Eds.), *Affect and cognition* (pp. 229–242). Hillsdale, NJ: Erlbaum.

Izard, C. E., & Malatesta, C. W. (1987). Perspectives on emotional development: Vol. I. Differential emotions theory of early emotional development. In J. Osofksy (Ed.), *Handbook of infant development* (2nd ed., pp. 494–554). New York: Wiley.

Jackendoff, R. (1994). Word meanings and what it takes to learn them: Reflections on the Piaget-Chomsky debate. In W. F. Overton & D. S. Palermo (Eds.), *The nature and ontogenesis of meaning* (pp. 129–144). Hillsdale, NJ: Erlbaum.

James, W. (1912). *Essays in radical empiricism.* New York: Longmans, Green.

James, W. (1975). *Pragmatism and the meaning of truth.* Cambridge, MA: Harvard University Press.

Johnson, M. (1999). Embodied reason. In G. Weiss & H. F. Haber (Eds.), *Embodiment: The intersection of nature and culture* (pp. 81–102). New York: Routledge.

Kainz, H. P. (1988). *Paradox, dialectic, and system: A contemporary reconstruction of the Hegelian problematic.* University Park: Pennsylvania State University Press.

Kant, I. (1966). *Critique of pure reason* (F. M. Muller, Trans.). New York: Anchor Books. (Original work published 1781)

Kaplan, A. (1964). *The conduct of inquiry: Methodology for behavioral science.* San Francisco: Chandler Publishing.

Karmiloff-Smith, A. (1991). Beyond modularity: Innate constraints and developmental change. In S. Carey & R. Gelman (Eds.), *The epigenesis of mind: Essays on biology and cognition* (pp. 171–197). Hillsdale, NJ: Erlbaum.

Kauffman, S. (1992). Origin of order in evolution: Self-organization and selection. In F. J. Varela & J. Dupuy (Eds.), *Understanding origins: Contemporary views on the origin of life, mind and society* (Boston Studies in the Philosophy of Science, Vol. 130, pp. 153–181). Boston: Kluwer Academic.

Kauffman, S. (1995). *At home in the universe: The search for the laws of self-organization and complexity.* New York: Oxford University Press.

Kent, T. (1991). Hermeneutics and genre: Bakhtin and the problem of communicative interaction. In D. R. Hiley, J. F. Bohman, & R. Shusterman (Eds.), *The interpretive turn: Philosophy, science, culture* (pp. 282–303). Ithaca, NY: Cornell University Press.

Kuhn, D., Garcia-Mila, M., Zohar, A., & Andersen, C. (1995). Strategies of knowledge acquisition. *Monographs of the Society for Research in Child Development, 60*(4, Serial No. 245).

Kuhn, T. S. (1962). *The structure of scientific revolutions.* Chicago: University of Chicago Press.

Kuhn, T. S. (1977). *The essential tension.* Chicago: University of Chicago Press.

Kuo, Z.-Y. (1967). *The dynamics of behavior development.* New York: Random House.

Laing, R. D. (1960). *The divided self.* New York: Pantheon Books.

Lakatos, I. (1978a). *Mathematics, science and epistemology: Philosophical papers* (Vol. 2). New York: Cambridge University Press.

Lakatos, I. (1978b). *The methodology of scientific research programmes: Philosophical papers* (Vol. 1). New York: Cambridge University Press.

Lakoff, G. (1987). *Women, fire, and dangerous things: What categories reveal about the mind.* Chicago: University of Chicago Press.

Lakoff, G., & Johnson, M. (1999). *Philosophy in the flesh: The embodied mind and its challenge to western thought.* New York: Basic Books.

Langer, J. (1994). From acting to understanding: The comparative development of meaning. In W. Overton & D. Palermo (Eds.), *The nature and ontogenesis of meaning* (pp. 191–214). Hillsdale, NJ: Erlbaum.

Latour, B. (1993). *We have never been modern.* Cambridge, MA: Harvard University Press.

Laudan, L. (1977). *Progress and its problems: Towards a theory of scientific growth.* Berkeley: University of California Press.

Laudan, L. (1984). *Science and values: The aims of science and their role in scientific debate.* Los Angeles: University of California Press.

Laudan, L. (1996). *Beyond positivism and relativism: Theory, method, and evidence.* Boulder, CO: Westview Press.

LeDoux, J. (1996). *The emotional brain: The mysterious underpinnings of emotional life.* New York: Touchstone.

Lehrman, D. S. (1970). Semantic and conceptual issues in the nature-nurture problem. In L. R. Aronson, E. Tobach, D. S. Lehrman, & J. S. Rosenblatt (Eds.), *Development and evolution of behavior: Essays in memory of T. C. Schneirla* (pp. 17–52). San Francisco: Freeman.

Lerner, R. M. (1978). Nature, nurture, and dynamic interactionism. *Human Development, 21,* 1–20.

Lerner, R. M. (2002). *Concepts and theories of human development* (3rd ed.). New York: Random House.

Leventhal, H. (1982). The integration of emotion and cognition: A view from perceptual-motor theory of emotion. In M. S. Clark & S. T. Fiske (Eds.), *Affect and cognition* (pp. 121–156). Hillsdale, NJ: Erlbaum.

Levins, R., & Lewontin, R. (1985). *The dialectical biologist.* Cambridge, MA: Harvard University Press.

Lewis, M. (1993). The emergence of human emotions. In M. Lewis & J. Haviland (Eds.), *Handbook of emotions* (pp. 223–235). New York: Guilford Press.

Lewontin, R. C. (2000). *The triple helix: Inside and outside: Gene, organism, and environment.* Cambridge, MA: Harvard University Press.

Liben, L. S. (1999). Developing an understanding of external spatial representations. In I. E. Sigel (Ed.), *Development of mental representation: Theories and applications* (pp. 297–321). Mahwah, NJ: Erlbaum.

Lickliter, R., & Honeycutt, H. (2003). Evolutionary approaches to cognitive development: Status and strategy. *Journal of Cognition and Development, 4,* 459–473.

Lourenço, O., & Machado, A. (1996). In defense of Piaget's theory: A reply to 10 common criticisms. *Psychological Review, 103,* 143–164.

Lovejoy, A. O. (1936). *The great chain of being.* Cambridge, MA: Harvard University Press.

Luhmann, N. (1995). *Social systems.* Stanford, CA: Stanford University Press.

Luria, A. R. (1981). *Language and cognition* (J. V. Wertsch, Ed.). New York: Wiley Intersciences.

Magnusson, D. (1998). The logic and implications of a person-oriented approach. In R. B. Cairns, L. R. Bergman, & J. Kagan (Eds.), *Methods and models for studying the individual* (pp. 33–63). London: Sage.

Magnusson, D., & Stattin, H. (1998). Person-context interaction theories. In W. Damon (Editor-in-Chief) & R. M. Lerner (Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 685–760). New York: Wiley.

Malatesta, C. Z., Culver, C., Tesman, J. R., & Shepard, B. (1989). The development of emotion expression during the first two years of life. *Monographs of the Society for Research in Child Development, 54*(1 Series No. 219).

Mameli, M., & Bateson, P. (in press). Innateness and the sciences. *Biology and Philosophy.*

Mandler, G. (1982). The structure of value: Accounting for taste. In M. S. Clark & S. T. Fiske (Eds.), *Affect and cognition* (pp. 211–227). Hillsdale, NJ: Erlbaum.

Mandler, J. M. (1992). How to build a baby: Vol. II. Conceptual primitives. *Psychological Review, 99,* 587–604.

Marcovitch, S., & Lewkowicz, D. J. (2004). U-Shaped functions: Artifact or hallmark of development? *Journal of Cognition and Development, 5,* 113–118.

Margolis, J. (1987). *Science without unity: Reconciling the human and natural sciences.* New York: Basil Blackwell.

Mayr, E. (1982). *The growth of biological thought.* Cambridge, MA: Harvard University Press.

McCarthy, T. (1991). *Ideals and illusions: On reconstruction and deconstruction in contemporary critical theory.* Cambridge, MA: MIT Press.

McCarthy, T. (1993). Introduction. In J. Habermas (Ed.) & F. G. Lawrence (Trans.), *The philosophical discourse of modernity* (pp. vii-xvii). Cambridge, MA: MIT Press.

McGuire, S., Manke, B., Saudino, K. J., Reiss, D., Hetherington, E. M., & Plomin, R. (1999). Perceived competence and self-worth during adolescence: A longitudinal behavioral genetic study. *Child Development, 70,* 1283–1296.

Mead, G. H. (1934). *Mind, self and society: From the standpoint of a social behaviorist.* Chicago: University of Chicago Press.

Merleau-Ponty, M. (1962). *Phenomenology of perception* (C. Smith, Trans.). London: Routledge & Kegan Paul.

Merleau-Ponty, M. (1963). *The structure of behavior* (A. Fisher, Trans.). Boston: Beacon Press.

Messick, S. (1995). Validity of psychological assessment: Validation of inferences from persons' responses and performances as scientific inquiry into score meaning. *American Psychologist, 50,* 741–749.

Miller, J. G. (1996). Theoretical issues in cultural psychology. In J. W. Berry, Y. H. Poortinga, & J. Pandey (Eds.), *Handbook of cross-cultural psychology: Theory and method* (pp. 85–128). Boston: Allyn & Bacon.

Mueller, U., & Carpendale, J. I. M. (2004). From joint activity to joint attention: A relational approach to social development in infancy. In J. I. M. Carpendale & U. Mueller (Eds.), *Social interaction and the development of knowledge* (pp. 215–238). Mahwah, NJ: Erlbaum.

Mueller, U., & Overton, W. F. (1998a). Action theory of mind and representational theory of mind: Is dialogue possible? *Human Development, 41,* 127–133.

Mueller, U., & Overton, W. F. (1998b). How to grow a baby. A re-evaluation of image-schema and Piagetian action approaches to representation. *Human Development, 41,* 71–111.

Nagel, E. (1957). Determinism and development. In D. B. Harris (Ed.), *The concept of development* (pp. 15–24). Minneapolis: University of Minnesota Press.

Nagel, E. (1967). The nature and aim of science. In S. Morgenbesser (Ed.), *Philosophy of science today* (pp. 5–13). New York: Basic Books.

Nagel, E. (1979). *The structure of science* (2nd ed.). Cambridge, MA: Hackett Publishing.

NICHD Early Child Care Research Network. (2004). Trajectories of physical aggression from toddlerhood to middle childhood. *Monographs of the Society for Research in Child Development, 69*(4 Serial No. 278).

Nijhout, H. F. (1990). Metaphors and the role of genes in development. *BioEssays, 12,* 441–446.

Nisbet, R. (1969). *Social change and history.* New York: Oxford University Press.

Nucci, L. P. (1996). Morality and the personal sphere of action. In E. Reed, E. Turiel, & T. Brown (Eds.), *Values and knowledge* (pp. 41–60). Hillsdale, NJ: Erlbaum.

Ogden, T. H. (1986). *The matrix of the mind: Object relations and the psychoanalytic dialogue.* Northvale, NJ: Aronson.

Oppenheimer, L. (1991). Determinants of action: An organismic and holistic approach. In L. Oppenheimer & J. Valsiner (Eds.), *The origins of action: Interdisciplinary and international perspectives* (pp. 37–63). New York: Springer-Verlag.

Overton, W. F. (1973). On the assumptive base of the nature-nurture controversy: Additive versus interactive conceptions. *Human Development, 16,* 74–89.

Overton, W. F. (1984). World views and their influence on psychological theory and research: Kuhn-Lakatos-Laudan. In H. W. Reese (Ed.), *Advances in child development and behavior* (Vol. 18, pp. 191–226). New York: Academic Press.

Overton, W. F. (1990). Competence and procedures: Constraints on the development of logical reasoning. In W. F. Overton (Ed.), *Reasoning, necessity, and logic: Developmental perspectives* (pp. 1–32). Hillsdale, NJ: Erlbaum.

Overton, W. F. (1991a). Competence, procedures and hardware: Conceptual and empirical considerations. In M. Chandler & M. Chapman (Eds.), *Criteria for competence: Controversies in the assessment of children's abilities* (pp. 19–42). Hillsdale, NJ: Erlbaum.

Overton, W. F. (1991b). Historical and contemporary perspectives on developmental theory and research strategies. In R. Downs, L. Liben, & D. Palermo (Eds.), *Visions of aesthetics, the environment, and development: The legacy of Joachim Wohlwill* (pp. 263–311). Hillsdale, NJ: Erlbaum.

Overton, W. F. (1991c). The structure of developmental theory. In H. W. Reese (Ed.), *Advances in child development and behavior* (Vol. 23, pp. 1–37). New York: Academic Press.

Overton, W. F. (1994a). The arrow of time and cycles of time: Concepts of change, cognition, and embodiment. *Psychological Inquiry, 5,* 215–237.

Overton, W. F. (1994b). Contexts of meaning: The computational and the embodied mind. In W. F. Overton & D. S. Palermo (Eds.), *The nature and ontogenesis of meaning* (pp. 1–18). Hillsdale, NJ: Erlbaum.

Overton, W. F. (1994c). Interpretationism, pragmatism, realism, and other ideologies. *Psychological Inquiry, 5,* 260–271.

Overton, W. F. (1997). Beyond dichotomy: An embodied active agent for cultural psychology. *Culture and Psychology, 3,* 315–334.

Overton, W. F. (1998). Developmental psychology: Philosophy, concepts, and methodology. In W. Damon (Editor-in-Chief) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 107–188). New York: Wiley.

Overton, W. F. (2002). Understanding, explanation, and reductionism: Finding a cure for Cartesian anxiety. In L. Smith & T. Brown (Eds.), *Reductionism* (pp. 29–51). Mahwah, NJ: Erlbaum.

Overton, W. F. (2003). Metatheoretical features of behavior genetics and development. *Human Development, 46,* 356–361.

Overton, W. F. (2004a). Embodied development: Ending the nativism-empiricism debate. In C. Garcia Coll, E. Bearer, & R. Lerner (Eds.), *Nature and nurture: The complex interplay of genetic and environmental influences on human behavior and development* (pp. 201–223). Mahwah, NJ: Erlbaum.

Overton, W. F. (2004b). A relational and embodied perspective on resolving psychology's antinomies. In J. I. M. Carpendale & U. Mueller (Eds.), *Social interaction and the development of knowledge* (pp. 19–44). Mahwah, NJ: Erlbaum.

Overton, W. F., & Dick, A. S. (in press). A competence-procedural and developmental approach to logical reasoning. In M. J. Roberts (Ed.), *Integrating the mind.* Hove, UK: Psychology Press.

Overton, W. F., & Ennis, M. (in press). Cognitive-developmental and behavior-analytic theories: Evolving into complementarity. *Human Development.*

Overton, W. F., & Horowitz, H. (1991). Developmental psychopathology: Differentiations and integrations. In D. Cicchetti & S. Toth (Eds.), *Rochester Symposium on Developmental Psychopathology* (Vol. 3, pp. 1–41). Rochester, NY: University of Rochester Press.

Overton, W. F., & Jackson, J. (1973). The representation of imagined objects in action sequences: A developmental study. *Child Development, 44,* 309–314.

Overton, W. F., & Reese, H. W. (1973). Models of development: Methodological implications. In J. R. Nesselroade & H. W. Reese (Eds.), *Life-span developmental psychology: Methodological issues* (pp. 65–86). New York: Academic Press.

Overton, W. F., & Reese, H. W. (1981). Conceptual prerequisites for an understanding of stability-change and continuity-discontinuity. *International Journal of Behavioral Development, 4,* 99–123.

Oyama, S. (1989). Ontogeny and the central dogma: Do we need the concept of genetic programming in order to have an evolutionary perspective. In M. R. Gunnar & E. Thelen (Eds.), *Minnesota Symposia on Child Psychology: Vol. 22. Systems and development* (pp. 1–34). Hillsdale, NJ: Erlbaum.

Oyama, S. (2000). *The ontogeny of information: Developmental systems and evolution* (2nd ed.). Durham, NC: Duke University Press.

Pepper, S. C. (1942). *World hypotheses.* Los Angeles: University of California Press.

Pepper, S. C. (1979). Contextualistic criticism. In M. Rader (Ed.), *A modern book of esthetics: An anthology* (5th ed., pp. 404–416). New York: Holt, Reinhart and Winston.

Piaget, J. (1952). *The origins of intelligence in children.* New York: Norton.

Piaget, J. (1954). *The construction of reality in the child.* New York: Basic Books.

Piaget, J. (1967). *Six psychological studies.* New York: Random House.

Piaget, J. (1971). *Biology and knowledge.* Chicago: University of Chicago Press. (Original work published 1967)

Piaget, J. (1977). The role of action in the development of thinking. In W. F. Overton & J. M. Gallagher (Eds.), *Knowledge and development* (pp. 17–42). New York: Plenum Press.

Piaget, J. (1980). *Adaptation and intelligence: Organic selection and phenocopy.* Chicago: University of Chicago Press. (Original work published 1974)

Piaget, J. (1985). *The equilibration of cognitive structures.* Chicago: University of Chicago Press.

Piaget, J. (1992). *Morphisms and categories: Comparing and transforming.* Hillsdale, NJ: Erlbaum.

Piaget, J. (1995). *Sociological studies.* New York: Routledge.

Piaget, J., & Garcia, R. (1991). *Toward a logic of meanings.* Hillsdale, NJ: Erlbaum.

Pierce, C. S. (1992). *Reasoning and the logic of things: The Cambridge conference lectures of 1898.* Cambridge, MA: Harvard University Press.

Pinker, S. (1997). *How the mind works.* New York: Norton.

Pinquart, M., & Silbereisen, R. K. (2004). Human development in times of social change: Theoretical considerations and research needs. *International Journal of Behavioral Development, 28,* 289–298.

Plomin, R. (1986). *Development, genetics, and psychology.* Hillsdale, NJ: Erlbaum.

Plomin, R. (1994). *The limits of family influence: Genes experience and behavior.* New York: Guilford Press.

Plomin, R., & Rutter, M. (1998). Child development, molecular genetics, and what to do with genes once they are found. *Child Development, 69,* 1223–1242.

Popper, K. (1959). *The logic of scientific discovery.* London: Hutchinson.

Prosch, H. (1964). *The genesis of twentieth century philosophy.* New York: Doubleday.

Putnam, H. (1983). *Realism and reason: Philosophical papers* (Vol. 3). New York: Cambridge University Press.

Putnam, H. (1987). *The many faces of realism.* Cambridge, England: Cambridge University Press.

Putnam, H. (1990). *Realism with a human face.* Cambridge, MA: Harvard University Press.

Putnam, H. (1995). *Pragmatism.* Cambridge, MA: Blackwell.

Quine, W. V. (1953). *From a logical point of view.* Cambridge, MA: Harvard University Press.

Randall, J. H. (1960). *Aristotle.* New York: Columbia University Press.

Reed, E. S. (1993). The intention to use a specific affordance: A conceptual framework for psychology. In R. H. Wozniak & K. W. Fischer (Eds.), *Development in context: Acting and thinking in specific environments* (pp. 45–76). Hillsdale, NJ: Erlbaum.

Reese, H. W., & Overton, W. F. (1970). Models of development and theories of development. In L. R. Goulet & P. B. Baltes (Eds.), *Life-span developmental psychology: Research and theory* (pp. 115–145). New York: Academic Press.

Ricoeur, P. (1984). *Time and narrative* (Vol. 1, K. McLalughlin & D. Pellauer, Trans.). Chicago: University of Chicago Press.

Ricoeur, P. (1991). *From text to action: Vol. II. Essays in hermeneutics* (K. Blamey & J. B. Thompson, Trans.). Evanston, Ill: Northwestern University Press.

Robins, R., & Tracy, J. L. (2003). Setting an agenda for a person-centered approach to personality development. *Monographs of the Society for Research in Child Development, 67*(1 Serial No. 272), 110–122.

Rogoff, B. (1990). *Apprenticeship in thinking: Cognitive development in sociocultural activity.* New York: Oxford University Press.

Rogoff, B. (1993). Children's guided participation and participatory appropriation in socialcultural activity. In R. H. Wozniak & K. W. Fischer (Eds.), *Development in context: Acting and thinking in specific environments* (pp. 121–154). Hillsdale, NJ: Erlbaum.

Rorty, R. (1979). *Philosophy and the mirror of nature.* Princeton, NJ: Princeton University Press.

Rose, H., & Rose, S. (Eds.). (2000). *Alas, poor Darwin: Arguments against evolutionary psychology.* New York: Harmony Books.

Ross, W. D. (1959). *Aristotle.* Cleveland, OH: World Publishing.

Rozeboom, W. W. (1997). Good science is abductive, not hypothetico-deductive. In L. L. Harlow, S. A. Mulaik, & J. H. Steiger (Eds.), *What if there were no significance tests?* (pp. 335–391). Mahwah, NJ: Erlbaum.

Russell, J. (1996). *Agency: Its role in mental development.* Hove, UK: Erlbaum, Taylor and Francis.

Saarni, C., Mumme, D. L., & Campos, J. (1998). Emotional development: Action, communication, and understanding. In W. Damon (Editor-in-Chief) & N. Eisenberg (Vol. Ed.), *Handbook of child psychology: Vol. 3. Social, emotional, and personality development* (5th ed., pp. 237–310). New York: Wiley.

Sabini, J., Siepmann, M., & Stein, J. (2001). Authors' response to commentaries. *Psychological Inquiries, 12,* 41–48.

Sampson, E. E. (1996). Establishing embodiment in psychology. *Theory and Psychology, 6,* 601–624.

Santostefano, S. (1995). Embodied meanings, cognition and emotion: Pondering how three are one. In D. Cicchetti & S. L. Toth (Eds.), *Rochester Symposium on Developmental Psychopathology: Vol. 6. Emotion, cognition, and representation* (pp. 59–132). Rochester, NY: University of Rochester Press.

Saxe, G. B. (1981). Body parts as numerals: A developmental analysis of numeration among the Oksapmin of New Guinea. *Child Development, 52,* 306–316.

Saxe, G. B. (1995, June). *Culture changes in social practices and cognitive development.* Paper presented to the annual meeting of the Jean Piaget Society, Berkeley, CA.

Scarr, S. (1992). Developmental theories for the 1990s: Development and individual differences. *Child Development, 63,* 1–19.

Schlick, M. (1991). Positivism and realism. In R. Boyd, P. Gasper, & J. D. Trout (Eds.), *The philosophy of science* (pp. 37–55). Cambridge, MA: MIT Press.

Schneirla, T. C. (1956). Interrelationships of the innate and the acquired in instinctive behavior. In P. P. Grasse (Ed.), *L'instinct dans le comportement des animaux et de l'homme* (pp. 387–452). Paris: Mason et Cie.

Schneirla, T. C. (1957). The concept of development in comparative psychology. In D. B. Harris (Ed), *The concept of development* (pp. 78–108). Minneapolis: University of Minnesota Press.

Scholnick, E. K., & Cookson, K. (1994). A developmental analysis of cognitive semantics: What is the role of metaphor in the construction of knowledge and reasoning. In W. F. Overton & D. S. Palermo (Eds.), *The nature and ontogenesis of meaning* (pp. 109–128). Hillsdale, NJ: Erlbaum.

Searle, J. (1992). *The rediscovery of the mind.* Cambridge, MA: MIT Press.

Shanon, B. (1993). *The representational and the presentational: An essay on cognition and the study of mind.* New York: Harvester Wheatsheaf.

Sheets-Johnstone, M. (1990). *The roots of thinking.* Philadelphia: Temple University Press.

Shweder, R. A. (1990). Cultural psychology: What is it? In J. W. Stigler, R. A. Shweder, & G. Herdt (Eds.), *Cultural psychology: Essays on comparative human development* (pp. 1–46). New York: Cambridge University Press.

Shweder, R. A., & Sullivan, M. A. (1990). The semiotic subject of cultural psychology. In L. Pervin (Ed.), *Handbook of personality: Theory and research* (pp. 399–416). Guilford: New York.

Siegler, R. S. (1989). Mechanisms of cognitive development. *Annual Review of Psychology, 40,* 353–379.

Siegler, R. S. (1996). *Emerging minds: The process of change in children's thinking.* New York: Oxford University Press.

Siegler, R. S., & Crowley, K. (1991). The microgenetic method: A direct means for studying cognitive development. *American Psychologist, 46,* 606–620.

Siegler, R. S., & Crowley, K. (1992). Microgenetic methods revisited. *American Psychologist, 47,* 1241–1243.

Siegler, R. S., & Munakata, Y. (1993, Winter). Beyond the immaculate transition: Advances in the understanding of change. *SRCD Newsletter.*

Sijtsma, K., & Molenaar, I. W. (2002). *Introduction to nonparametric item response theory* (Measurement methods for the social science, 5). Thousand Oaks, CA: Sage.

Skinner, B. F. (1971). *Beyond freedom and dignity.* New York: Bantam Books.

Skinner, B. F. (1984). Selection by consequences. *Behavioral and Brain Sciences, 7,* 1–43.

Smith, L. D. (1986). *Behaviorism and logical positivism: A reassessment of the alliance.* Stanford, CA: Stanford University Press.

Smith, L. D. (1990). Metaphors of knowledge and behavior in the behaviorist tradition. In D. E. Leary (Ed.), *Metaphors in the history of psychology* (pp. 239–266). New York: Cambridge University Press.

Spelke, E. S., & Newport, E. L. (1998). Nativism, empiricism, and the development of knowledge. In W. Damon (Editor-in-Chief) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 275–340). New York: Wiley.

Sroufe, L. A. (1979). Socialemotional development. In J. Osofsky (Ed.), *Handbook of infant development* (pp. 462–516). New York: Wiley.

Stace, W. T. (1924). *The philosophy of Hegel.* New York: Dover Publications.

Stern, W. (1938). *General psychology: From the personalistic standpoint.* New York: Macmillan.

Sternberg, R. J. (Ed.). (1984). *Mechanisms of cognitive development.* New York: Freeman.

Sugarman, S. (1987a). The priority of description in developmental psychology. *International Journal of Behavioral Development, 10,* 391–414.

Sullivan, H. S. (1953). *The interpersonal theory of psychiatry.* New York: Norton.

Suomi, S. J. (2000). A behavioral perspective on developmental psychopathology: Excessive aggression and serotonergic dysfunction in monkeys. In A. J. Sameroff, M. Lewis, and S. Miller (Eds.), *Handbook of developmental psychopathology* (2nd ed., pp. 237–256). New York: Plenum Press.

Taylor, C. (1964). *The explanation of behavior.* New York: Humanities Press.

Taylor, C. (1979). *Hegel and modern society.* New York: Cambridge University Press.

Taylor, C. (1985). *Human agency and language: Philosophical papers* (Vol. 1). New York: Cambridge University Press.

Taylor, C. (1991). The dialogical self. In D. R. Hiley, J. F. Bohman, & R. Shusterman (Eds.), *The interpretive turn: Philosophy, science, culture* (pp. 304–314). Ithaca, NY: Cornell University Press.

Taylor, C. (1995). *Philosophical arguments.* Cambridge, MA: Harvard University Press.

Thelen, E. (2000). Grounded in the world: Developmental origins of the embodied mind. *Infancy, 1,* 3–28.

Thelen, E., Schöner, G., Scheier, C., & Smith, L. (2001). The dynamics of embodiment: A field theory of infant preservative reaching. *Behavioral and Brain Sciences, 24,* 1–86.

Thelen, E., & Smith, L. (1998). Dynamic systems theories. In W. Damon (Editor-in-Chief) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 563–634). New York: Wiley.

Thelen, E., & Ulrich, B. D. (1991). Hidden Skills. *Monographs of the Society for Research in Child Development, 56*(1, Serial No. 223).

Tobach, E. (1981). Evolutionary aspects of the activity of the organism and its development. In R. M. Lerner & N. A. Busch-Rosnagel (Eds.), *Individuals as producers of their development: A life-span perspective* (pp. 37–68). New York: Academic Press.

Tobach, E., & Greenberg, G. (1984). The significance of T. C. Schneirla's contribution to the concept of integration. In G. Greenberg & E. Tobach (Eds.), *Behavioral evolution and integrative levels* (pp. 1–7). Hillsdale, NJ: Erlbaum.

Tooby, J., & Cosmides, L. (1992). The psychological foundation of culture. In J. H. Barkow, L. Cosmides, & J. Tooby (Eds.), *The adapted mind: Evolutionary psychology and the generation of culture* (pp. 19–139). New York: Oxford University Press.

Toulmin, S. (1953). *The philosophy of science.* New York: Harper & Row.

Toulmin, S. (1961). *Foresight and understanding.* New York: Harper & Row.

Toulmin, S. (1990). *Cosmopolis: The hidden agenda of modernity.* Chicago: University of Chicago Press.

Toulmin, S., & Goodfield, J. (1965). *The discovery of time.* New York: Harper & Row.

Uttal, D. H. (2000). Seeing the big picture map use and the development of spatial cognition. *Developmental Science, 3,* 247–264.

Valsiner, J. (1994). Irreversibility of time and the construction of historical developmental psychology. *Mind, Culture, and Activity, 1,* 25–42.

Valsiner, J. (1998a). The development of the concept of development: Historical and epistemological perspectives. In W. Damon (Editor-in-Chief) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 189–232). New York: Wiley.

Valsiner, J. (1998b). *The guided mind: A sociogenetic approach to personality.* Cambridge, MA: Harvard University Press.

van der Veer, R., & Valsiner, J. (1994). Reading Vygotsky: From fascination to construction. In R. van der Veer & J. Valsiner (Eds.), *The Vygotsky reader* (pp. 1–7). Cambridge, MA: Blackwell.

Varela, F. J., Thompson, E., & Rosch, E. (1991). *The embodied mind: Cognitive science and human experience.* Cambridge, MA: MIT Press.

von Bertalanffy, L. (1968a). *General system theory.* New York: George Braziller.

von Bertalanffy, L. (1968b) *Organismic psychology and systems theory.* Barre, MA: Barre Publishing.

von Wright, G. H. (1971). *Explanation and understanding.* Ithaca, NY: Cornell University Press.

Vreeke, G. J. (2000). Nature, nurture and the future of the analysis of variance. *Human Development, 44,* 32–45.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes.* Cambridge, MA: Harvard University Press.

Vygotsky, L. S. (1979). Consciousness as a problem in the psychology of behavior. *Soviet Psychology, 17,* 3–35.

Wapner, S., & Demick, J. (1998). Developmental analysis: A holistic, developmental, systems-oriented perspective. In W. Damon (Editor-in-Chief) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 761–806). New York: Wiley.

Wartofsky, M. (1968). *Conceptual foundations of scientific thought.* Toronto, Ontario, Canada: Macmillan.

Werner, H. (1948). *Comparative psychology of mental development.* New York: International Universities Press. (Original work published 1940)

Werner, H. (1957). The concept of development from a comparative and organismic point of view. In D. B. Harris (Ed.), *The concept of development: An issue in the study of human behavior* (pp. 125–148). Minneapolis: University of Minnesota Press.

Werner, H., & Kaplan, B. (1963). *Symbol formation.* New York: Wiley.

Wertsch, J. V. (1991). *Voices of the mind: A sociocultural approach to mediated action.* Cambridge, MA: Harvard University Press.

White, S. (1995). Toward an evolutionary epistemology of scientific reasoning. *Monographs of the Society for Research in Child Development, 60*(4, Serial No. 245), 129–136.

Winch, P. (1958). *The idea of a social science and its relation to philosophy.* London: Routledge & Kegan Paul.

Winer, B. J. (1962). *Statistical procedures in experimental design.* New York: McGraw-Hill.

Winnicott, D. W. (1965). *The maturational process and the facilitating environment.* New York: International Universities Press.

Winnicott, D. W. (1971). *Playing and reality.* New York: Basic Books.

Wittgenstein, L. (1958). *Philosophical Investigations* (3rd ed., G. E. M. Anscombe, Trans.). Englewood Cliffs, NJ: Prentice-Hall. (Original work published 1953)

Wohlwill, J. F. (1973). *The study of behavioral development.* New York: Academic Press.

Youniss, J., & Damon, W. (1992). Social construction in Piaget's theory. In H. Beilin & P. B. Pufall (Eds.), *Piaget's theory: Prospects and possibilities* (pp. 267–286). Hillsdale, NJ: Erlbaum.

Zajonc, R. B., Pietromonaco, P., & Bargh, J. (1982). Independence and interaction of affect and cognition. In M. S. Clark & S. T. Fiske (Eds.), *Affect and cognition* (pp. 211–227). Hillsdale, NJ: Erlbaum.

Zelazo, P. D. (1996). Towards a characterization of minimal consciousness. *New Ideas in Psychology, 14,* 63–80.

CHAPTER 3

The Making of Developmental Psychology

ROBERT B. CAIRNS and BEVERLEY D. CAIRNS

DEVELOPMENT AND HISTORY 90
BIOLOGICAL ROOTS: EMBRYOLOGY AND EVOLUTION 92
THE DEVELOPMENTAL PRINCIPLE 92
EVOLUTION AND DEVELOPMENT 94
THE EMERGENCE OF DEVELOPMENTAL PSYCHOLOGY (1882–1912) 96
Embryos and Infants 96
Memory and Intelligence 100
THE NEW PSYCHOLOGY IN THE UNITED STATES 104
MAKING DEVELOPMENTAL THEORY 107
Metaphysics and Development 108
Mental Development and Social Ontogeny 109
Sociogenesis 110
Toward a Critical Evaluation 111
DEVELOPMENTAL PSYCHOPATHOLOGY 114
OTHER TRENDS IN SCIENCE AND SOCIETY 117
Developmental Theory 118
Child Study 119
Development and Education 119
THEMES OF THE FOUNDATIONAL PERIOD 120
Knowledge and Consciousness 120
The Relations between Thoughts and Actions 121
Ontogeny and Phylogeny 122
Nature and Nurture 122
When Does Development End? 122
Morality and the Perfectibility of Humans 123
Social Applications 123
THE MIDDLE PERIOD (1913–1946): INSTITUTIONALIZATION AND EXPANSION 124
INSTITUTIONS AND DEVELOPMENT 125
MENTAL TESTING 126
LONGITUDINAL STUDIES 128
BEHAVIORISM AND LEARNING 129
MATURATION AND GROWTH 132
SOCIAL AND PERSONALITY DEVELOPMENT 135
MORAL DEVELOPMENT 136
THE DEVELOPMENT OF LANGUAGE AND COGNITION 138
DEVELOPMENTAL PSYCHOBIOLOGY AND ETHOLOGY 140
THEORETICAL TRENDS OF THE MIDDLE PERIOD 143
Social Neobehaviorism 143
Psychoanalysis 144
Field Theory and Ecological Psychology 145
COMMENTS ON THE MIDDLE PERIOD 146
THE MODERN ERA 147
SOCIAL LEARNING: RISE, DECLINE, AND REINVENTION 148
Rise 148
Decline 149
Reinvention 150
ATTACHMENT: DISCOVERY AND LOSS 151
The Phenomena of Attachment 151
Attachment Theory 152
COGNITIVE REEMERGENCE 153
HISTORICAL THEMES AND CONTEMPORARY ADVANCES 154
Knowledge and Consciousness 154
Thoughts and Actions 154
Ontogeny and Phylogeny 154
Nature and Nurture 155
When Does Development End? 155
Morality and the Perfectibility of Humans 155
Social Applications 155
TOWARD AN INTERDISCIPLINARY SCIENCE 156
REFERENCES 157

This chapter is an introduction to the ideas, people, and events that have guided scientific activity in developmental psychology over the past century. Its preparation has been facilitated by several recent publications on the history of developmental psychology. The views of the past held by active researchers are reflected in chapters of the edited volume, *A Century of Developmental Psychology* (Parke, Ornstein, Rieser, & Zahn-Waxler, 1994). The contributors are, with few exceptions, currently involved in contemporary research. Secondary commentaries can provide useful guides and interpretations, but there is no substitute for consulting original

sources. To that end, a reprint series containing historically significant original articles and volumes has been prepared by Wozniak (e.g., 1993, 1995).

Other recent volumes include the contributions of professional historians and others who are not enmeshed in current empirical debates of the discipline (e.g., Broughton & Freeman-Moir, 1982; Elder, Modell, & Parke, 1993). In addition, the social relevance and the making of the discipline in U.S. society have been told expertly by Sears (1975) and White (1996). Any single overview—including this one—can tell only part of the story.[1]

Adopting the convention used in the previous *Handbook of Child Psychology,* 20 years must lapse before a contribution or event qualifies as historical. Two decades constitute approximately one generation in the life of our science. This rule makes the task manageable and sharpens the focus on the events of the past.

DEVELOPMENT AND HISTORY

It is mildly ironic that an area committed to the study of the origins and development of behavior and consciousness traditionally has shown little interest in its own origins and development. In the great handbooks of the field, the first five (Carmichael, 1946; Murchison, 1931, 1933; Mussen, 1970) did not include historical overviews; in the 1983 edition of this volume, this state of affairs was changed when two chapters on history were included (Borstlemann, 1983; Cairns, 1983). The earlier reluctance to look to our past, though regrettable, is understandable. If substantive progress is to be made in new empirical research, it will be won by those who look ahead rather than backward. There are also institutional and economic limits on scholarship where journal space is precious, and historical reviews and comments are afforded low priority. The upshot is that contemporaneous research articles tend to bypass the work and insights of earlier investigators. This neglect of the past has been correlated with a more general tendency to give short shrift to competing findings, concepts, and interpretations. Such shortcomings in scholarship, if unchecked, can undermine real progress in the discipline.

Historical accounts are neither static nor immutable. As new information about the nature of developmental phenomena becomes available, perspectives on earlier events may shift in emphasis and interpretation. Similarly, as new findings and issues emerge, prior relevance can be reevaluated and viewed in a fresh light. The rediscovery of J. M. Baldwin's contributions is a case in point. With the increased interest in integrative concepts of cognitive, moral, and social development, it was perhaps inevitable that researchers should rediscover the intellectual foundation for developmental studies provided by Baldwin. A direct line of influence has been drawn between the concepts of J. M. Baldwin and those of Jean Piaget, L. S. Vygotsky, H. Wallon, and L. Kohlberg (see Broughton & Freeman-Moir, 1982; Cairns, 1992; Valsiner & van der Veer, 1993). The construction of the intellectual history of a science is necessarily an ongoing enterprise.

One point of consensus is that developmental psychology has its own distinctive history, which is associated with but independent of the history of experimental or general psychology. The year 1979—one century after Wundt established a psychology laboratory at the University of Leipzig—was the centennial of scientific psychology (Hearst, 1979). The assignment involves a modest fiction, since even a casual reading of the literature of the day indicates that the enterprise of modern psychology was already well under way in 1879 in the laboratories of Helmholtz, Fechner, Weber, Lotze, James, and Galton (Littman, 1979).

Looking backward, it might seem inevitable that the study of behavioral development should have emerged as the focal problem for the new science of psychology. Several of the founders of the discipline approached the subject matter of psychology from a developmental per-

[1] Professor Robert Cairns died on November 10, 1999. This chapter is based on the chapter written by Professor Cairns for the 5th edition of the *Handbook of Child Psychology* (1998) and was amended by Beverley D. Cairns and Richard M. Lerner. As was true for the 1998 version of the chapter, the present version owes much to two earlier chapters that Professor Cairns wrote on the history of developmental psychology (Cairns, 1983; Cairns & Ornstein, 1979) and to several people who contributed to the preparation of the earlier works: Beverley D. Cairns, Peter A. Ornstein, Robert R. Sears, William Kessen, Ronald W. Oppenheim, Alice Smuts, Lloyd Borstlemann, Robert Wozniak, Philip R. Rodkin, Kimberly Davidson, and the staff of the Center for Developmental Science.

spective, and the genetic theme was influential in philosophical and biological thought in the late nineteenth century. Alfred Binet in France, William Preyer and William Stern in Germany, Herbert Spencer and George J. Romanes in England, and several U.S. psychologists (from G. Stanley Hall and John Dewey to James Mark Baldwin and John B. Watson) agreed on the fundamental viewpoint of development, if little else. What is the fundamental viewpoint? Watson, who is often depicted as an opponent of the developmental approach, indicated that developmental methods require the continuous observation and analysis "of the stream of activity beginning when the egg is fertilized and ever becoming more complex as age increases" (1926, p. 33). For Watson, the developmental approach was:

> [the] fundamental point of view of the behaviorist—viz. that in order to understand man you have to understand the life history of his activities. It shows, too, most convincingly, that psychology is a natural science—a definite part of biology. (p. 34)

Nor was the kernel idea of development a new one for biological science or for psychology. It had guided the work and thinking of physiologist Karl von Baer (1828) and those who followed his early lead in the establishment of comparative embryology. It was also a basic theme in the earliest systematic statements of psychology (Reinert, 1979).

But not all of the founders of the new science subscribed to the developmental perspective or the assumption that psychology was a definite part of biology. Some of the most influential—including Wilhelm Wundt himself—had a different view. Noting the difficulties that one encounters in efforts to study young children in experimental settings, Wundt argued that "it is an error to hold, as is sometimes held, that the mental life of adults can never be fully understood except through the analysis of the child's mind. The exact opposite is the true position to take" (1907, p. 336).

Even the father of child psychology in America, G. Stanley Hall, relegated developmental concerns to minor league status in the new psychology. In the inaugural lectures at Johns Hopkins, Hall (1885) followed his mentor Wundt in holding that psychology could be divided into three areas: (1) experimental psychology, (2) historical psychology, and (3) the study of instinct. The study of children and adolescents was assigned to historical psychology, which included as well the study of primitive people and folk beliefs. Instinct psychology dealt with those processes and behaviors that were considered innate, thus encompassing much of what is today called comparative and evolutionary psychology. Of the three divisions, Hall considered experimental psychology to be the "more central and reduced to far more exact methods." These methods included the use of reaction time, psychophysical procedures, and introspection to examine the relations between sensation and perception. Historical and instinct psychology necessarily relied on observational and correlational methods, hence were seen as less likely to yield general and enduring principles. Hall's divisions were consistent with the proposals of numerous writers—Auguste Compte, John Stuart Mill, Wilhelm Wundt—who called for a second psychology to address aspects of human mind and behavior that were based in the culture (Cahan & White, 1992; Wundt, 1916). In Hall's account, the second psychology was a second-class psychology.

The division between experimental and developmental psychology has proved to be remarkably durable—but that is getting ahead of the story. The main point is that developmental issues could have been nuclear concerns for the new science, but they were not. They have not even played a significant role in the history of experimental psychology (see Boring, 1929/1950).

There is also consensus that the initiation of the scientific study of children represents the convergence of two forces, one social and the other scientific. The scientific background is the primary focus of this chapter, and our principal attention is given to the intellectual and empirical foundations of the discipline.

But there were also social and political roots. Sears (1975) observed, in his classic chapter titled "Your Ancients Revisited," that:

> By the end of the [nineteenth] century, there had developed a vaguely cohesive expertise within the professions of education and medicine, and the origins of social work as a helping profession were clearly visible. During the first two decades of the twentieth century, these professions began relevant research to improve their abilities, but their main influence on the future science was their rapidly expanding services for children in the schools, hospitals, clinics, and social agencies. This expansion continued after World War I, and it was in the next decade, the 1920s, that scientists from several nonprofessionally oriented ("pure science") disciplines began to join the

> researchers from the child-oriented professions to create what we now view as the scientific field of child development. But like the engineering sciences which evolved from physics and chemistry, child development is a product of social needs that had little to do with science qua science. . . . The field grew out of *relevance.* (p. 4, author's emphasis)

Whether it is viewed as a creation of social forces or as an inevitable outcome of open scientific inquiry, developmental psychology was established as a separate research discipline only within the past century. However, its scientific roots in biology extend back at least an additional 100 years. It was then that fundamental questions on the origin of life, species transmutation, and individual development began to generate empirical investigations.

BIOLOGICAL ROOTS: EMBRYOLOGY AND EVOLUTION

A strong case could be made that the early scientific roots of developmental psychology are to be found in embryology and evolutionary biology rather than in experimental psychophysics. Two core ideas in nineteenth-century biological thought directly shaped developmental psychology and require attention: (1) K. E. von Baer's developmental principle and (2) C. R. Darwin's evolutionary theory.

THE DEVELOPMENTAL PRINCIPLE

Karl Ernst von Baer (1792–1876) ranks as one of the great original biologists of the nineteenth century, alongside Curvier, Lamarck, and Darwin (Hamburger, 1970). Born in Estonia, of German ancestry, he did his pivotal work on anatomical development at Würzburg and Königsberg. The pioneer of comparative embryology, von Baer discovered the human ovum and the notochord (the gelatinous, cylindrical cord in the embryo of vertebrates around which, in higher forms, the backbone and skull develop). More relevant to this chapter, von Baer generalized beyond his empirical work in embryology and anatomy to enunciate general principles on the fundamental nature of ontogenetic change (von Baer, 1828–1837). He proposed that development proceeds, in successive stages, from the more general to the more specific, from relatively homogeneous states to increasingly differentiated hierarchically organized structures.

Although von Baer himself considered his developmental proposals to be revolutionary, they initially received only modest attention. After a bout of extreme fatigue, disappointment, and disillusionment, von Baer moved to Russia in 1834 and became librarian of the Academy of Science in St. Petersburg. Later, he was appointed leader of a Russian Arctic expedition where he conducted geographical, botanical, and biological research relevant to evolution and development. At the end of his career, he returned to Estonia, the country of his birth, and served as president of the University of Tartu.

Von Baer's developmental principles may seem commonplace to modern students; his general axioms are mentioned in introductory chapters of texts on biological and cognitive development. But when the ideas were first proposed, they challenged the then-dominant explanations for how development proceeds. Two views vied for prominence throughout most of the nineteenth century: (1) preformism and (2) epigenesis (Gould, 1977). Preformism held that developmental transformations were illusions because the essential characteristics of the individual had already formed at the beginning of ontogenesis. Only the size and relations of the parts to each other changed, and their essential properties were preset and predetermined. Although preformism is dismissed nowadays as drawings of a miniaturized adult in the womb, the concept of a homunculus is not essential to the model (Gould, 1977).

What was basic to preformism was the idea that development could bring about changes in the shape and relationships among organs, but development fails to bring out new or novel properties. Hence, stability and predictability from embryogenesis and infancy to adulthood was expected, if one's measurement tools were adequate. Absurd? Perhaps, except that the proposals do not appear entirely unreasonable if one considers parallels in modern genetic theory, where genes endure unchanged even though the organisms that they create do not. Moreover, particular alleles are assumed to be associated with the ontogeny of specific structural and behavioral characteristics. At another level, modern developmental researchers often assume that the primary traits and dispositions—such as attachment and aggression—develop and become stabilized during the interchanges of infancy and early childhood. These dispositions and the internal-

ized models thus generated may be transformed over development into age-appropriate expression, but not in underlying type.

The other major nineteenth-century approach to development was epigenetic. Novelties were brought about through progressive transformations in development. But what determines the course of the transformations and, ultimately, the nature of the finished product? The earlier vitalistic answer—*entelechy,* the Aristotelian vital force—was no longer acceptable to most nineteenth-century epigeneticists. Among other problems, the teleological answer looked to be an admission of ignorance. But without developmental regulation and direction, what would prevent growth from occurring willy nilly into diverse and monstrous forms? The concept of epigenesis-as-developmental-transformations could not stand alone. It required additional assumptions to account for the sequential properties of development and its orderly nature (von Bertalanffy, 1933; Gould, 1977).

This theoretical void was filled in nineteenth-century biology by the recapitulation concept prominent in *Naturphilosophie,* a significant philosophical movement in Germany. Recapitulation bound together the two main forms of organic creation, ontogeny (individual development) and phylogeny (species development), into a single framework. In embryonic development, organisms are assumed to pass through the adult forms of all species that had been ancestral to them during evolution. Organisms in embryogenesis experience a fast-forward replay of evolutionary history. With this predictable and orderly progression, novel features may be added only in the terminal or mature phases of development. This concept, labeled the "biogenetic law" by Ernst Haeckel (1866), was enormously influential in nineteenth-century biology. The recapitulation hypothesis also provided the biological metaphor for Hall's account of adolescence and S. Freud's original formulations of repression and psychosexual stages (Sulloway, 1979, pp. 198–204, 258–264).

In opposition to prominent biologists of his day, von Baer argued that recapitulation was based on faulty observations and romanticism rather than logic. In his own research, he found that organisms of related species were indeed highly similar in anatomy during their early stages of embryonic growth. However, contrary to the expectations of the recapitulation interpretation, species-typical differences appeared early in the course of development, not only in its final stages. Moreover, the organization at successive stages seemed to uniquely fit the organism for its current circumstances. It was not merely the mechanical repetition of earlier ancestral forms, as implied by the recapitulation model (de Beer, 1958). To sharpen the epigenetic account, von Baer (1828–1837) offered four laws by which development could be described:

1. The general features of a large group of animals appear earlier in the embryo than the special features.
2. Less general characteristics are developed from the more general, and so forth, until the most specialized appear.
3. Each embryo of a given species, instead of passing through the stages of other animals, departs more and more from them.
4. Fundamentally, therefore, the embryo of a higher animal is never like a lower animal, but only like its embryo.

Von Baer held that development was a continuing process of differentiation and organization; hence, novelties could arise at each stage, not merely the terminal one. When this embryological principle was later applied to structures, actions, thoughts, and social behaviors (e.g., Piaget, 1951; Werner, 1940/1948), it produced far-reaching consequences. The conclusion proposed in 1828 was that developmental processes demand rigorous study in their own right; they cannot be derived from analogies to evolution.

Although von Baer was recognized as a leading embryologist, his generalizations on the nature of development were not immediately accepted. They were inconsistent with broadly held beliefs in biology, and von Baer's rejection of the Darwinian account of evolution probably did not help matters. Despite compelling empirical and comparative evidence, for most of the nineteenth century von Baer's developmental generalizations fared poorly in open competition with the recapitulation proposal.

Von Baer's developmental ideas were not entirely ignored in his time, however. It was in Carpenter's (1854) influential physiological textbook that Herbert Spencer discovered von Baer's formulation of the developmental principle. Spencer (1886) wrote that von Baer's work represented "one of the most remarkable indications of embryology" and stated:

> It was in 1852 that I became acquainted with von Baer's expression of this general principle. The universality of law had ever been with me as a postulate, carrying with it a correlative belief, tacit if now avowed, in unity of method throughout Nature. This statement that every plant and animal, originally homogeneous, becomes gradually heterogeneous, set up a process of coordination among accumulated thoughts that were previously unorganized, or but partially organized. (p. 337)

Spencer's work, in turn, inspired the genetic epistemology of James Mark Baldwin and his successors, including Jean Piaget. Von Baer's other line of influence on psychology appears in animal behavior and comparative psychology through the work of Z.-Y. Kuo, Schneirla, and Carmichael in the twentieth century. The modern dynamic systems model, transactional theory, developmental psychobiology, and developmental science have von Baer's principle of development as a kernel concept (e.g., see Lerner, Chapter 1; Thelen & Smith, Chapter 6, this *Handbook,* this volume). Moreover, time and timing are central in von Baer's formulation, consistent with modern concepts of critical periods in embryogenesis and sensitive periods in behavior development, and with the concepts of neoteny and heterochrony in behavioral evolution (Cairns, 1976; de Beer, 1958; Gottlieb, 1992; Gould, 1977).

There have been some major revisions, of course. The developmental principle identified a key feature of epigenesis—homogeneity giving way to heterogeneity through progressive differentiation, then integration into reorganized structures—but it did not solve the problem of how development is directed. In his writing, he remained vaguely teleological, a position that seemed consistent with *Naturphilosophie* but out of line with his rigorous experimental work and careful theoretical analysis. Leaving the directionality issue open-ended invited continued application of the recapitulation proposition. The puzzle of directionality in embryological development took almost 100 years to solve (von Bertalanffy, 1933).

EVOLUTION AND DEVELOPMENT

"To what extent and in what manner has the work of Charles Darwin influenced developmental psychology?" (Charlesworth, 1992, p. 5). In answering his question on Darwin's impact, Charlesworth concludes that the influence is much less direct and much weaker than has been traditionally accepted. He finds only few direct links to Darwinian propositions or to evolutionary theory in modern developmental psychology. This is regrettable because:

> Darwin's contribution and its current elaborations can enhance developmental research, whereas the latter can assist the former by putting its hypotheses to competent test. (p. 13)

It should be noted that Charlesworth's conclusion on the modest impact of evolutionary theory on developmental psychology is at variance with other judgments in the literature. For example, Kessen (1965) credited Darwin with dramatically changing our concept of children and childhood. This effect, according to Kessen (1965), was both direct (through Darwin's published observations of his infant son) and indirect (through the profound impact of evolutionary ideas on the developmental contributions of Preyer, J. M. Baldwin, Hall, and Taine). A similar conclusion is expressed by Wohlwill (1973), who tracks three lines of Darwinian influence on developmental thought through Baldwin, Preyer, and S. Freud.

The proposition regarding the impact of Darwin depends in large measure on how broadly or narrowly Darwin's influence is defined. As observed above, the study of individual development is rooted in embryology, not in evolution. In her overview of the history of embryology, Jane Oppenheimer (1959) observes that the methods and concepts of embryological science owe little to the concepts of evolutionary biology. Moreover, von Baer himself explicitly rejected the Darwinian construction of evolution.

The picture becomes blurred, however, with Haeckel's (1866) wedding of ontogenetic and evolutionary concepts in the recapitulation principle. Haeckel was an enormously influential advocate of Darwinian evolution in the second half of the nineteenth century, and his influence is strongly represented in Preyer (1882/1888–1889) and Hall (1904). Moreover, a direct line can be drawn from Darwinian commentaries on the evolution of the emotions and intelligence to the work of comparative psychologists Romanes (1889) and Morgan (1896), and from these pivotal figures in the late nineteenth century to the foundation of modern comparative work on psychobiological integration and concepts of learning. The importance of evolutionary themes is told by Sigmund Freud himself (1957). It is also a core message in Sulloway's (1979) intellectual biography that was aptly titled, "Freud, Biologist of the Mind."

Those aspects of Darwin's evolutionary theory that have had only a modest influence on developmental psy-

chology concern its strong implications for the heritability of behavior and the evolution of behavioral propensities. At least one modern model of sociobiology views ontogenetic variation as "developmental noise" (Wilson, 1975). This is because sociobiological emphasis is on (a) variations in structures of societies, not variations in individual life histories, and (b) the biological contributors to those variations in group structures, including the genetic determinants of aggressive behaviors, altruism, and cooperation. As in the logic of Wundt, immature expression of these phenomena in individuals is seen as ephemeral and individualistic; genetic and evolutionary forces may be viewed more clearly when they are aggregated across persons into societal structures (see Gottlieb, Wahlsten, & Lickliter, Chapter 5, this *Handbook,* this volume).

In contrast, evolutionary concepts have had a major impact on research in comparative studies of development in animals from the mid-nineteenth century to the present. In England, Douglas Spalding (1873) reported the remarkable effects of early experience in establishing filial preferences in newly hatched chicks. His experimental demonstrations seemed to confirm that phyletic and ontogenetic influences must operate in tandem, that the young animal was predisposed to form preferences during a period of high sensitivity shortly after hatching, and that the experiences that occurred then were especially effective in the rapid establishment of preferences.

George John Romanes, a young scientist who had the confidence of Darwin, was impressed by Spalding's demonstrations and, with him, emphasized the early formation and plasticity of behavior within the framework of its evolutionary foundation. More generally, Romanes's analysis of the stage-paced development of sexuality and cognition served as a basic text for the two most important theorists in developmental psychology, Sigmund Freud and James Mark Baldwin. *Mental Evolution in Man* (Romanes, 1889) was one of the most annotated books in Freud's library, and Sulloway (1979) suggests that it provided inspiration for Freud's later emphasis on the early appearance of infantile sexuality. In accord with recapitulation theory, Romanes had placed the onset of human sexuality at 7 weeks. J. M. Baldwin (1895), for his part, gives explicit credit to Romanes and Spencer as providing inspiration and direction to the work embodied in his *Mental Development in the Child and the Race.* It should also be observed that Romanes, whose aim was to clarify the evolution of the mind and consciousness, is also regarded as the father of comparative psychology (Gottlieb, 1979; Klopfer & Hailman, 1967).

Studies of behavioral development in nonhumans were also rapidly becoming a focal concern in North America. The Canadian physiologist, Wesley Mills, offered an especially clear statement of the need for developmental studies in a *Psychological Review* paper that appeared in 1899. In the article, Mills took E. L. Thorndike (1898) to task for his narrow view of how experimental analyses can contribute to understanding animal learning and intelligence.

For Mills, the notions of ecological validity and biological constraints on learning would not be unfamiliar ideas. In a remarkable passage, Mills (1899) outlines a strategy that anticipates the importance of understanding development in context. He wrote:

> Were it possible to observe an animal, say a dog, from the moment of its birth onward continuously for one year, noting the precise conditions and all that happens under these conditions, the observer being unnoticed by the creature studied, we should, I believe be in possession of one of the most valuable contributions it is possible to make to comparative psychology. This would imply not one, but several persons giving up their whole time, day and night, by turns, to such a task. As yet, but very imperfect approaches have been made to anything of the kind; nevertheless, such as they have been, they are the most valuable contribution thus made, in the opinion of the present writer, and the more of such we have the better.
>
> If to such a study another were added, in which the effect of altering conditions from time to time with the special object of testing the results on an animal or animals similarly closely observed from birth onward, we should have another most valuable contribution to comparative psychology; but experiment on animals whose history is unknown must, in the nature of the case, be very much less valuable than in such an instance as that just proposed. (p. 273)

However convincing Mills's proposals may appear in retrospect, E. L. Thorndike completed the work, and experimental methods won the battle of the day and, for the most part, the war of the century. By the next generation, experimental studies of learning in animals and children were dominated by Thorndikian short-term, nondevelopmental experimental designs, at least in the United States. It should be noted, in Thorndike's defense, that the main point of his experimental laboratory work, first described in *Animal Intelligence* (1898, p. 1), was to clarify "the nature of the processes of association in the animal mind." It was, in effect, the study of

animal consciousness and the role that representation plays in learning methods. Thorndike's statement of the "law of effect" proved to be enormously influential.

In summary, thoughtful investigators of development in nonhuman animals have been concerned with evolutionary and ontogenetic issues and how they are interrelated. The focus was reflected in the work of Romanes (1889), Morgan (1896), and Mills (1898) in the latter part of the nineteenth century, and in the work of Z.-Y. Kuo (1930), Schneirla (1959), Tinbergen (1972), and Hinde (1966) in the mid-twentieth century. This dual concern, along with the research on animals and young humans that it has stimulated, has helped establish the conceptual and empirical foundations for a fresh developmental synthesis. Whether Darwinian thought has been influential for modern developmental psychology depends on which evolutionary ideas are evaluated and which aspects of developmental psychology are examined.

THE EMERGENCE OF DEVELOPMENTAL PSYCHOLOGY (1882–1912)

Developmental studies flourished *despite* the influence of traditional psychophysical laboratories rather than because of it. The study of behavioral and mental development was going full steam in the 1890s. By mid-decade, genetic or developmental psychology had its own scientific journals (*L'Année Psychologique,* 1894; *Pedagogical Seminary,* 1891, later to be renamed the *Journal of Genetic Psychology*), research institutes (Sorbonne, 1893; Clark University, 1890), influential textbooks (e.g., *The Mind of the Child,* 1982; *L'Évolution Intellectuelle et Morale de l'Enfant,* 1893; *Mental Development in the Child and the Race,* 1895), professional organizations (e.g., Child Study Section of the National Education Association, 1893; Société Libre pour l'Étude Psychologique de l'Enfant, 1899), and psychological clinic (University of Pennsylvania, 1896). As early as 1888, Hall was able to refer to the "nearly fourscore studies of young children printed by careful empirical and often thoroughly scientific observers" (Hall, 1888, p. xxiii). The field had advanced so far that it was christened with a name—Paidoskopie—to emphasize its newly won scientific independence (Compayré, 1893). Happily, the activity survived the name.

There is, however, no strong consensus on which year should serve as an anchor for developmental psychology's centennial. The problem is that the area is now sufficiently diverse so that one can point to several landmark dates, depending on which movement or which pioneer one wishes to commemorate. The founding of the child development research institute at Clark University and the establishment of the journal *Pedagogical Seminary,* by Hall, were clearly of signal importance for the area. But to celebrate Hall's contributions over those of Alfred Binet can hardly be justified. Binet, at almost the same time, was laying the foundations for modern experimental child psychology at the Sorbonne and establishing *L'Année Psychologique* as a prime source for developmental publications. Perhaps the dilemma may be eased by recognizing that these major advances were themselves beneficiaries of a zeitgeist that seems to have begun about 1880 and gained significant momentum with the publication of William Preyer's *The Mind of the Child* in 1882/1888–1889.[2]

The book has been called "the first work of modern psychology" (see Reinert, 1979), providing "the greatest stimulation for the development of modern ontogenetic psychology" (Munn, 1965).

Not everyone agrees with these high evaluations of Preyer's work or of its originality (see, for instance, Bühler, 1930; Kessen, 1965; and below). Nonetheless, Preyer's book served as a powerful catalyst for the further study of development in psychology and in biology, and 1882 seems to be a reasonable date for us to begin this story of the development of modern developmental psychology. In addition to Hall and Binet, two other persons—James Mark Baldwin and Sigmund Freud—contributed much to the molding of the area. The nature and extent of their contributions are the main focus of this section.

Embryos and Infants

When *The Mind of the Child* was published, William T. Preyer (1841–1897) intended it to be only the first in-

[2] There is some ambiguity about the actual publication date of *The Mind of the Child.* In the preface to the second edition, Preyer tells us that "the first edition of this book appeared in October, 1881" (p. xvi). That seems straightforward enough, but the publication date of the original German work was 1882. The discrepancy apparently arose because of the lag between the time when the author signed off the Preface (in Jena, October 6, 1881) and the time the finished book was actually published. Similar ambiguity surrounds the traditional assignment of 1879 as the founding of Wundt's laboratory; it was an ongoing enterprise at the time, and William James claimed priority anyway.

stallment of a more comprehensive study of the nature of development. He completed the project 4 years later, with publication of *The Special Physiology of the Embryo* (Preyer, 1885). That these two contributions were not translated together and studied as a unit is a pity, for, in Preyer's mind, the issues to which they were addressed were mutually dependent and complementary. Preyer assumed that the methods and concepts applicable to embryological study could be applied with advantage to behavioral study, and that investigations of the one would support and complement investigations of the other. Why then two books? As Preyer (1882/1888–1889) explains it:

> I proposed to myself a number of years ago, the task of studying the child, both before birth and in the period immediately following, from the physiological point of view, with the object of arriving at an explanation of the origin of separate vital processes. It was soon apparent to me that a division of the work would be advantageous to its prosecution. For life in the embryo is so essentially different a thing from life beyond it, that a separation must make it easier both for the investigator to do his work and for the reader to follow the expositions of the results. I have, therefore, discussed by itself, life before birth, in the "Physiology of the Embryo." (p. ix)

Preyer completed work on both phases of the project, embryogenesis and postnatal development, in a significant number of species (including humans). It is almost true that his feat has yet to be matched by another single investigator.

What drew Preyer to the study of development in the first place? That question cannot be answered definitively, but we do know that he was trained in physiology in Germany and, with others of his generation, came under the spell of Ernst Haeckel's vision of the unity of science and the centrality of development in evolution and life. Preyer recognized that the scientific program of modern biology would be incomplete without a careful analysis of human development from conception through maturity, and that such a program would necessarily be interdisciplinary. As he put it, such prenatal and postnatal observations "are necessary, from the physiological, the psychological, the linguistic, and the pedagogic point of view, and nothing can supply their place" (1882/1888–1889, pp. 186–187). Beyond Preyer's appreciation that intellectual and scholarly breadth were required for the productive study of children, he established methodological standards for the enterprise. The procedures that he endorsed, and followed, belied the proposition that children, even immature and unborn ones, could not be studied objectively and with profit.

Preyer was not the first person to undertake detailed observations of his offspring for scientific purposes. A professor of Greek and philosophy at the University of Marburg, Dietrich Tiedemann (1748–1803), had earlier employed the method, and his 1787 monograph *Observations on the Development of Mental Capabilities in Children* (Murchison & Langer, 1927), seems to have been the first known published psychological diary of longitudinal development in children, according to Reinert (1979). In the 100 years between Tiedemann and Preyer, several studies appeared, some of which were sufficiently free of parental bias and distortion from other sources to be considered useful scientific contributions (Reinert, 1979, has an informative account of this work).

An article by Charles Darwin played an important role in stimulating further interest in the endeavor. In 1877, it appeared in the new psychological journal *Mind,* having been triggered by the appearance, 2 months earlier, of a translation of H. Taine's (1876) parallel observations in the immediately preceding issue. Darwin's article was based on 37-year-old notes he made during the first two years of one of his sons. Although inferior to the other reports in terms of systematicity of observation and depth of reporting, Darwin's contribution served to legitimize the method and promoted research with children.

The methodological standards that Preyer established for himself are admirable, even by today's criteria. He reports that he "adhered strictly, without exception," to the following rules:

- Only direct observations were cited by the investigator, and they were compared for accuracy with observations made by others.
- All observations were recorded immediately and in detail, regardless of whether they seemed uninteresting or "meaningless articulations."
- To the extent possible, observations were unobtrusive and "every artificial strain upon the child" was avoided.
- "Every interruption of one's observation for more than a day demands the substitution of another observer, and, after taking up the work again, a verification of what has been perceived and noted down in the interval."

- "Three times, at least, every day the same child is to be observed, and everything incidentally noticed is to be put upon paper, no less than that which is methodically ascertained with reference to definite questions" [*The Mind of the Child* (1882/1888–1889), vol. 2, pp. 187–188].

In brief, most problems of observation and categorization were anticipated by Preyer, including those of reliability and observer agreement.

How Preyer chose to organize his findings is almost as interesting as his methods and findings. For Preyer, the mind of the child, like Gaul, can be divided into three parts: (1) senses, (2) will, and (3) intellect. Because his knowledge about the comparative development of vision, hearing, taste, smell, touch, and temperature perception was surprisingly broad, many—but not all—of Preyer's (1882/1888–1889) generalizations on the "Development of Senses" were on target. A few of his statements were demonstrably wrong. For instance, he wrote "the normal human being at birth hears nothing" (p. 96). Preyer arrived at an opposite (and correct) set of conclusions on the capabilities of various nonhuman species to hear at birth. In light of the care and precision of most of the observations, it's puzzling that Preyer made such an elementary error. In retrospect, we may speculate that a primary flaw was theoretical rather than methodological. Preyer's conclusions on neonatal incompetence were colored by his general assumption that human beings were less mature at birth than were species ancestral to them (i.e., neoteny). This was not the first time, nor the last, that strongly held hypotheses about the nature of children led to erroneous conclusions, despite disconfirming empirical evidence.

The "Development of Will" provided an informative and informed analysis of the onset of such patterns as sitting, grabbing, pointing, standing, and other motoric acts. But Preyer was looking for more than a behavioral inventory: He hoped to find out how the pattern arose. For instance, "deliberate" pointing seemed to arise from the early action of abortive "seizing" or "grabbing," and only at about 9 months of age did "pointing" gain the capacity to signal to others the child's wants and needs. Among other things, he concludes: "The first deliberate intention-movements occur only after the close of the first three months" (p. 332). Preyer thus found, in the study of the development of movement patterns, reflexes, and other actions, a possible clue to the systematic analysis of the onset of intentionality.

The third part of *The Mind of the Child,* "Development of Intellect," includes the consideration of language comprehension and production as well as the development of social cognition, including the concept of the self. Preyer's discussion proceeds, with uncommonly good sense, from a description of the onset of landmarks of language development to an attempt to determine when the notion of "ego," or the self, develops. For Preyer, it occurs when the child can recognize "as belonging to him the parts of his body that he can feel and see" (p. 189). Whatever the other merits of that proposal, it permits Preyer to undertake a series of observations and mini-experiments on the matter. One section deals with the ability of children to respond to their reflections in a mirror; another, with the uses and misuses of personal pronouns by young children.

In addition to his study of infancy and early childhood, Preyer left another legacy to modern developmentalists, *The Special Physiology of the Embryo* (1885). To complete his analysis of the "origin of separate vital processes," Preyer conducted experiments and made observations on the embryos of invertebrates, amphibia, birds, and various mammals. Some of these observations—on the prenatal development of sensory and motor functions—have only recently been confirmed and extended using modern techniques. In line with recent interpretations of early development, Preyer concluded that (a) integrated, spontaneous motor activity was antecedent to the development of responsiveness to sensory stimulation, and (b) motor activity may provide the substrate for later mental, emotional, and linguistic performance. Because of his pioneering studies, he is acknowledged to be the father of behavioral embryology (Gottlieb, 1973).

Preyer has sometimes been depicted as the prototypic methodologist—careful, precise, compulsive, and pedestrian. On this score, Karl Bühler (1930) writes that *The Mind of the Child* was "a remarkable book full of interesting and conscientious observations, but poor in original ideas" (p. 27) and that "Preyer himself was no pioneer in psychology" (p. 27). Others have echoed the exact words, along with the sentiment that his book was more like a developmental psychophysiology than a developmental psychology (Reinert, 1979).[3]

[3] Did cultural stereotypes play a role in the evaluation of *The Mind of the Child?* For instance, Compayré (1893) called the book a "monument of German assiduousness." Mateer (1918) remarked (in the context of comparing Frenchman Peréz's

Has Preyer's empirical reputation outrun his theoretical contribution to developmental psychology? The answer depends in part on what aspects of theory one chooses to focus on. Preyer's main concern in preparing both *Mind of the Child* and *Special Physiology* was the clarification of a basic issue of development: the relations between ontogeny and phylogeny of behavior, and how these two processes influenced each other. His categorization of the dates of onset was *not* an end in itself, to develop a behavioral timetable. Rather, his aim was to establish the lawful sequence of development of sensory and cognitive systems so that meaningful generalizations could be drawn between species and among systems in development.

Hence, for Preyer (1882/1888–1889), one key theoretical issue was how to reconcile competing claims of the "nativists" and the "empiricists" in the origin and perfection of the "vital processes" of behavior and thought. As far as human vision (or other sensory processes) was concerned, he concluded that "my observations show that . . . *both parties are right*" (vol. 1, p. 35, emphasis added). In a discussion that constitutes an early model for the developmental landscape of C. H. Waddington (1971), he speculates that "The brain comes into the world provided with a great number of impressions upon it. Some of these are quite obscure, some few are distinct" (vol. 2, p. 211). Through experience, some of the pathways are obliterated, and others are deepened.

Lest Preyer be written off as a naïve nativist, it should be added that his position was closer to the bidirectional approach of modern developmental psychobiology than to the innate ideas of Immanuel Kant. Drawing on studies of the comparative anatomy of the brain as well as cross-species comparisons of behavior, he concluded (1882/1888–1889) that there is feedback between experience and normal structural development in the brain. He offered a foresightful statement of the bidirectional structure-function hypothesis, reaching the conclusion that "*The brain grows through its own activity*" (vol. 2, p. 98, emphasis added). How then does the individual contribute to his or her own development? Preyer's answer was clearly speculative, but it followed the same line of reasoning that is reflected in the structure-function bidirectional proposals offered in the next century by developmental psychobiologists and modern neurobiologists. (See also Brandtstädter, Chapter 10; Gottlieb et al., Chapter 5, this *Handbook,* this volume.)

The theoretical import of Preyer's behavioral timetable comes into focus when viewed in the context of Haeckel's biogenetic law. Its key assumption was that human maturation was *accelerated* with respect to ancestral species. That is, as noted earlier, in this concept humans are presumed to pass through the several stages of development more rapidly than the species from which they were derived, so that evolutionary "novelties" and distinctively human characteristics appear at maturity, not in infancy. To be tested, the view required precise information about the relative rates of maturation; hence, the need for exactness in plotting the onset of particular behaviors. But Preyer was not a biogenetic apologist. He offered the compelling hypothesis that humans' maturation rate was retarded relative to ancestral species, an idea that ran counter to the accepted version of recapitulation. Human beings should enjoy a longer (not shorter) period of immaturity than their closest phyletic relatives. Accordingly, in most "vital processes" and behavior, there should be relatively greater plasticity in development and opportunities for learning for children than for nonhuman animals (vol. 1, pp. 70–71, 1882/1888–1889). This is essentially an early statement of behavioral neoteny: The relatively slower rate of maturation should be an advantage in making for an extended period of curiosity, flexibility, and adaptability in human beings (see also Fiske, 1883). Echoes of his theoretical interpretations can be found in modern studies of ontogenetic-phyletic relations (e.g., Cairns, 1976; de Beer, 1958; Mason, 1980) and the bidirectionality of structure-function relations (e.g., Gottlieb, 1976; Z.-Y. Kuo, 1967).

Tracing the heritage that Preyer left for developmental study, we find that he set high standards for scientific observation of behavioral development. Though not unflawed, his observations were carefully recorded and sanely written. For those who followed him, Preyer embedded the study of children in the framework of biological science, and he demonstrated how interdisciplinary techniques could be employed. Beyond the methodological message, there was a theoretical one. Preyer was a man of his times, evolutionary in outlook and committed to the clarification of the relations between ontogeny

"logical, brilliant style" with that of Preyer) that: "The French write brilliantly and convincingly but their technique is apt to be at fault. They seem to hit intuitively upon right premises and conclusions, although their data may be unconvincing or scanty. The German work is more stolid, more convincing in its facts but less inspiring in application" (p. 24).

and phylogeny, between nature and nurture. Surprisingly, he was perhaps as influential in embryology as in developmental psychology. Through his work, talented young men and women were recruited to experimental embryology (including Hans Spemann, who identified "critical periods" and "organizers" in embryological development). Perhaps most important, Preyer demonstrated, by his successful integration of experimental studies of human and nonhuman young, that the investigation of behavioral development could be as much a scientific enterprise as a social, humanistic movement. Happily, other colleagues in America and Europe understood the message.

Memory and Intelligence

In an article on the scientific contributions of Alfred Binet (1857–1911), Siegler (1992) observes: "It is ironic that Binet's contribution should be so strongly associated with reducing intelligence to a single number, the IQ score, when the recurring theme of his research was the remarkable diversity of intelligence" (p. 175). That is only one of the ironies in Binet's work and life. Another is that he was arguably the greatest French psychologist of his day; yet, he was unable to obtain a professorship in France. Moreover, the intelligence test that he developed with Simon, which was intended to provide guides on how "to learn to learn," has been used over the past century as a basis for classifying children and adults into intellectual categories that are presumed to be constant over life.

Statements about historical priority and influence are delicate matters, but among non-French observers there is no serious debate over the claim that Alfred Binet was France's first significant experimental psychologist.[4] What makes his work of special importance for this chapter is that he was the premier early experimental child psychologist whose observations extended beyond the laboratory. The results have been far-reaching. Jenkins and Paterson (1961) observed, "Probably no psychological innovation has had more impact on the societies of the Western world than the development of the Binet-Simon scales" (p. 81). Given the influence of this procedure identified with Binet's name, it is understandable, yet regrettable, that his other contributions to developmental psychology have gained so little attention. As it turns out, it took experimental child psychology some 70 years to catch up with some of Binet's insights on cognition and the organization of memory.

Throughout his career, Binet was characterized by an independence of thought and action, starting with his introduction to psychology. It was his third choice in careers, after he had dropped out of law school and medical training (Wolf, 1973). In 1879/1880, Binet began independent reading in psychology at the Bibliothèque Nationale in Paris. Curiously, he selectively avoided experimental psychology (the Wundtian version) by reading little or no German, and he took no trips to Leipzig. Shortly after he began work in psychology, he published his first paper, a useful discussion of experiential contributions to the psychophysics of two-point tactile discrimination. For research training, Binet affiliated himself with the distinguished neurologist, Jean Martin Charcot, at the Salpêtrière (a noted Paris hospital). Over a period of seven years, Binet collaborated with Charcot and Charles Féré in studies of hypnotism and its expression in normal persons and in the patient population. Binet's introduction to "experimental methods" thus was some distance removed from the then-acceptable laboratory procedures. His apprenticeship in research led to some spectacular controversies, with young Binet in the middle of the fray. The problem was that certain phenomena reported by the Salpêtrière group defied credibility—for example, that the effects of hypnotic suggestion migrate from one side of the body to the other by virtue of electromagnetic influences (a very large magnet was used in demonstrations). Attempts to replicate the phenomena elsewhere proved unrewarding. As it turned out, the research procedures followed by Binet and Féré were remarkably casual, and they gave scant attention to the possible suggestibility of their subjects or of themselves (see Siegler, 1992).

An absurd idea? In light of our present knowledge about the brain and hypnotism, it was a thoroughly naïve proposition. But this is the stuff out of which discoveries are made. Féré shortly afterward (1888) became the first investigator to discover that emotional changes were correlated with electrical changes in the human body. Naïve or not, he is credited with discovering the resistance method of measurement and developing the

[4] But not France's first child psychologist. Peréz (1851/1878) published his *The First Three Years of the Child* several years before Preyer's *The Mind of the Child* (1882/1888–1889). The two authors covered the same ground, but, as Reinert (1979) indicates, Peréz was generally considered to be the more imaginative and Preyer the more methodical.

first statement of arousal theory (Thompson & Robinson, 1979, p. 444).

While he was at the Salpêtrière, Binet's research skills were simultaneously being sharpened in the embryological laboratory of E. G. Balbiani. He became acquainted firsthand with the rigorous procedures of biological research and the then-current concepts of evolution, development, and genetics. This work culminated in 1894 with his being awarded a doctorate in natural science from the Sorbonne and his appointment as Director of the Laboratory of Physiological Psychology at the same institution. In that year, Binet also founded and edited *L'Année Psychologique,* co-authored two books (one dealing with the determinants of the extraordinary memory feats of chess masters and calculators; the other, a critical treatment of the methods and approaches of experimental psychology), and published 15 articles. Among the articles were studies of the psychology of aesthetics, suggestibility, the nervous system of invertebrates, perception in children, and studies on the development of memory. Only one year's work? No, because some of the studies had been ongoing over the previous 2 to 3 years; yes, because his publication list was just as impressive in 1895 as in 1894. This pattern was maintained until his death in 1911; except that, later in his career, he also wrote and supervised plays that were produced in Paris and London (Wolf, 1973).

Prolificacy can be embarrassing if one hasn't much to write about. That seems not to have been a problem for Binet, due in large measure to his "very open, curious, and searching" mind. Binet was so described when, prior to completing his doctorate, he was named laureate by the Moral and Political Academy of the Institute of France (Wolf, 1973). Although he began his research training in the library, he soon became committed to the task of expanding the empirical foundations of the area in ways that seemed novel if not heretical. He early rejected the conventional methods of experimental psychology (as it had been practiced in Leipzig and Baltimore) as being narrow and misleading. On introspective experiments, he wrote, in his *Introduction to Experimental Psychology:*

> Subjects go into a little room, respond by electrical signals, and leave without so much as a word to the experimenter. . . . With the three choices only—"equal," "greater," or "less"—they often seem to set up the results of the experiments in advance. Their aim is simplicity, but is only a factitious one, artificial, produced by the suppression of all troublesome complications. (Binet, Phillippe, Courtier, & Henri, 1894, pp. 28–30)

Nor was he impressed by the large-scale studies by Hall and his students, who used the questionnaire methodology. On the latter, Binet (1903) wrote:

> The Americans, who love to do things big, often publish experiments made on hundreds or even thousands of persons. They believe that the conclusive value of a study is proportional to the number of observations. That is a myth. (p. 299)

These hardly were the sorts of comments that would endear him to his U.S. and German colleagues, and Howard C. Warren, one of the more generous reviewers, reciprocated by "confessing to a feeling of disappointment when it is considered what even a short book like this might have been" (Warren, 1894).

What Binet had to offer psychology was a pragmatic, multimethod, multipopulation approach to the problems of behavior. Instead of relying merely on introspection and psychophysiological experimentation, Binet thoroughly dissected behavioral phenomena. To explore memory, for instance, he varied the nature of the stimuli (memory for figures and for linguistic material; memory for meaningful sentences versus individual words), the subjects tested (chess masters and superior "calculators" who performed on the stage; normal children and retarded children), measures employed (free recall, recognition, physiological measures of blood pressure, and electrical activity), type of design (large group samples, individual analysis over long-term periods), and statistics employed. Through it all, Binet selected designs, procedures, and subjects with a purpose, not merely because they were available. To investigate imagination and creativity, he studied gifted playwrights and explored new techniques (inkblots, word association, and case history information).

Such methodological catholicism is not without pitfalls. He was open not only to new discoveries but to new sources of error. In his day, he received high praise and devastating criticism for his work, and both seemed earned. The early studies were vulnerable: Binet was in the process of learning a trade for which there were, as yet, no masters. He came out on the short end of a devastating exchange on the "magnetic" nature of hypnotism (Siegler, 1992), and there was equally justified

criticism by H. S. Jennings (1898–1899) on Binet's interpretations of his studies on the psychic life of the lower beasts. S. Franz (1898), a student of J. M. Cattell, took him to task for the quality of his statistical presentation in a series of studies on the relation between cognition and physical measures in children. Florence Mateer (1918) doubtless had Binet in mind when she commented that "the French write brilliantly and convincingly but their technique is apt to be at fault" (p. 24). Such errors—and the attitudes they fed—unfortunately masked the fundamental brilliance of Binet's work. Though shy in personal demeanor, Binet as a scientist was not a timid man; he was outspoken, and his criticism of naïve generalizations and wrongheaded conceptualizations placed him at odds with beliefs held by then-dominant leaders of the discipline. He published what he believed, and seems to have judged the long-term gains to be worth the short-term costs to his career and influence.

Binet reported demonstrational studies of memory and perception that he had conducted with his two young daughters. The work was extended in succeeding years not only with his children (through adolescence) but also with diverse subjects and areas of memory. Along with his collaborators, notably Victor Henri, the work was extended to persons who were extraordinarily talented or retarded. Because Binet operated on the working assumption that the study of normal processes was the key to understanding special talents or deficits, his laboratory also made a major investment in the analysis of memory in normal children, adolescents, and adults. Binet was highly sensitive to the need for convergent analyses that intersect on a common problem. He argued in 1903 that "our psychology is not yet so advanced" that we can limit our analyses to information obtained in the laboratory; rather, complex intellectual functions are best understood in studies of persons "whom we know intimately, to relatives and friends."

Binet did not, however, disdain large-scale research designs; he simply believed that they were insufficient *in themselves* to tell the full story about the nature of memory processes. In collaboration with Henri, he conducted a remarkable series of studies on memory development that involved several hundred children.

In one of their analyses, Binet and Henri (1894) found that the children reconstructed material into chunks of information that were meaningful to them. It should be noted that this idea of active reorganization has now returned to occupy the attention of "modern" views of memory and recall (e.g., Paris, 1978). In the words of Binet and Henri, as translated by Thieman and Brewer (1978):

> The children have a tendency to replace a word from the spoken text when the word appears in a rather lofty style, with another word with which they are better acquainted, and which they encounter more often in their own conversation. Their act of memory is accompanied by an act of translation. (p. 256)

How Binet and his colleagues chose to follow up this experimental work is instructive. Noting that other researchers might do things differently, Binet embarked on an intensive study of "superior functions" in relatives (namely, his two adolescent daughters) and friends. Binet did not give up on experimental designs so much as he extended their boundaries by conducting experiments on persons whose histories and characteristics were known intimately to him. For Binet, the key to unlocking the secrets of intelligence involved not only mapping its outline in large-scale studies but also making a detailed tracing of its internal features in individual analysis. This movement back and forth—from a focus on individuals to a focus on large samples, then back to individuals—was a distinctive and deliberate research strategy.

Attention to two or three children, rather than to a single individual or to large samples, inevitably leads one to a focus on the differences among them. So it was with Binet. He was not the first psychologist to be curious about differences among persons and their assessment and explanation. Francis Galton had earlier used sensory discrimination tests to assess differences in basic abilities. The rationale for such tests was stated succinctly by Galton (1883): "The only information that reaches us concerning outward events appears to pass through the avenue of our senses; and the more perceptive the senses are of difference, the larger is the field upon which our judgment and intelligence can act" (p. 27).

In other words, modest differences at the level of sensation would be directly reflected in "complex" cognitive functioning, or would be multiplied. A similar rationale (and research strategy) was recommended by the U.S. psychologist, James McKeen Cattell, in an article entitled "Mental Tests and Measurement" (1890). Specifically, Cattell proposed that mental measurement should employ several tests of "basic" sensory and motor abilities, including assessments of color discrimination, reaction time, and other standard psychophysical

procedures. Other experimental psychologists—including Joseph Jastrow at Wisconsin, Hugo Munsterberg at Freiberg, and J. A. Gilbert at Yale and Iowa (1894, 1897)—concurred.

Characteristically, Binet and Henri (1895) took an approach that was radically different from that of their U.S. and German colleagues. It was, however, wholly consistent with the conclusions they had arrived at in their earlier studies of memory development; namely, it was absurd to focus on elementary units of memory as opposed to a recall for ideas and meaning. Furthermore, from Binet's studies of individuals, it seemed clear that great differences could be observed among persons of "higher" mental functions, including language skills, suggestibility, commonsense judgments, and imagination. Binet and Henri (1895) thus argued for a methodological strategy that was precisely opposite to that of Galton and Cattell:

> The higher and more complex a process is, the more it varies in individuals; sensations vary from one individual to another, but less so than memory; memory of sensations varies less than memories of ideas, and so on. The result is that if one wishes to study the differences between two individuals, it is necessary to begin with the most intellectual and complex processes, and it is only secondarily necessary to consider the simple and elementary processes. (p. 417)

Although "complex processes" are more difficult to measure than simple ones, less precision is required because individual differences in complex functions are much greater than in elementary ones. The more fundamental problem that Binet and Henri identified is that it is easier to separate the intellect into its parts than it is to put the elements together and create a functioning, competent whole. The greatest challenges arise not in the initial assessment of sensory elements but in determining how they should be *combined* to predict intellectual performance. How should the components be appropriately weighted, and what is the nature of the process by which sensations are translated into cognitions? The solution that Binet and Henri offered was a wholly pragmatic one: Bypass the recombination problem and assess the complex functions directly. Given this simplifying solution, Binet and Henri outlined a programmatic approach to the assessment of individual differences that was completed 10 years later.

The child study movement in France directly contributed to the eventual development of workable mental tests. Soon after the formation of the *Société Libre pour l'Étude Psychologique de l'Enfant* (Society for the Psychological Study of the Child), Binet was invited to become a member and he shortly became a leading voice in its activities and publications. The *Société* not only prodded the Ministry of Public Instruction to think constructively about the needs of retarded children, but was also influential in having a commission appointed to set up special classes. Binet, as a leader of the Société, was appointed to the commission. It was not entirely coincidental, then, that he was invited to develop tests for identifying children who could benefit from special instruction, and the results of the work were reported in a series of articles in *L'Année Psychologique* in 1905 (Binet & Simon, 1905) and later extended (Binet, 1908, 1911). Although the articles offered guidelines for assessment in each of three areas (medical, educational, psychological), their greatest attention was given to psychological tests. The 30 tests of the 1905 scale followed the outline offered by Binet and Henri (1895) some 10 years earlier, except some procedures—including the suggested use of inkblots to study imagination—were omitted and new techniques were borrowed from other investigators—among them, Ebbinghaus's incomplete sentence technique (1897) and Jacobs's (1887) "memory for digits" test.

Although most of the basic concepts of intelligence test construction were reflected in the initial scale (e.g., multiple tests arranged in order of difficulty, various areas of competence tested, age standardization, and external validation), the refinement of the scale so it could be used productively with normal children required extensive further revision. The task was begun by Binet (1908, 1911) and completed by U.S. developmental psychologists, notably Goddard (1911) and Terman (1916). Despite the magnitude of their achievement, Binet and Simon (1905) were fully aware of the limitations of the technique as well as its promise. They wrote in conclusion:

> We have wished simply to show that it is possible to determine in a precise and truly scientific way the mental level of an intelligence, to compare this level with a normal level, and consequently to determine by how many years a child is retarded. Despite the inevitable errors of a first work, which is of a groping character, we believe that we have demonstrated this possibility. (p. 336)

They had indeed.

Binet eschewed identification as a theorist, even declining initially to offer a definition of intelligence, "a problem of fearful complexity." He added, in 1908:

> Some psychologists affirm that intelligence can be measured; others declare that it is impossible to measure intelligence. But there are still others, better informed, who ignore these theoretical discussions and apply themselves to the actual solving of the problem. (p. 163)

Despite his disinclination to define intelligence, Binet was not hesitant to take a strong stand on the nature of intellectual functioning and its determinants. The design of the tests themselves reflects the assumption that the aim was to diagnose different levels of functioning, not to assess the child's "faculty" for thought. Consistent with this functional view of cognitive processing, Binet argued that one of the test's primary virtues would be to identify children who needed to "learn to learn." For Binet, intellectual adaptation reflected dynamic, ever-changing processes that underwent constant modification and reorganization; hence, he focused on the ways that these processes become organized over time, and their "plasticity and extendibility" (1909/1978, pp. 127–128). On this score, he proposed a program of "mental orthopedics" that should be followed to enhance cognitive functioning. In *Les Idées Modernes sur les Enfants* (1909/1978), Binet specifically deplores the notion that "the intelligence of the individual is a fixed quantity" and protests the idea as "brutal pessimism" (p. 126). Ironically, exactly the opposite assumption fueled the enthusiasm of most U.S. translators for the test, along with the conviction that this "fixed quantity" is hereditarily determined, and a child's "true score" can be identified within limits of sampling error.

How can we summarize Binet's primary contributions to understanding development? Beyond his specific insights on psychological phenomena, three fundamental advances may be attributed to this remarkable scientist. The first concerns the insight that the assessment of individual differences in higher-order cognition requires a molar rather than a molecular strategy. In retrospect, the idea seems to make a good deal of sense, but it was embraced by U.S. psychology only after the research of Binet and Simon made the conclusion inescapable. After all, it seems intuitively obvious that precise, microanalytic experimental methods *should* be superior to molar, complex ones in predicting everyday behavior. The idea dies slowly, and it is alive and well today in the study of social development. As with cognition, recent molecular analyses of social interactions appear to fare less well in prediction and classification than do molar assessments of the same phenomena. Exactly why molar techniques have an advantage continues to be a matter of debate, and Binet's analysis may still be the key.

A second contribution is related to the first. For Binet, the "two sciences of psychology," described later by Cronbach (1957), were both essential. Binet pioneered both experimental child psychology and the study of individual differences. His stance on the matter is embodied in the methodological credo: "To observe and experiment, to experiment and observe, this is the only method that can obtain for us a particle of truth" (Binet, 1904/1973, p. 293). As Binet saw it, problems inevitably arise when the two basic methodologies are divorced. If questions are raised that cannot be settled by experimentation, then they should be dismissed "since they are not susceptible to the sole criterion of certainty" that modern psychology can accept.

One other, more general legacy requires comment. Beyond the other pioneers in the field, Binet was one of the first to provide convincing evidence for the proposition that a *science* of human development was possible. He understood the complexity of the problem, but he persevered in the attempt to help developmental psychology "become a science of great social utility" (Binet, 1908). Binet demonstrated that an empirical science of behavioral development in humans was within grasp, if the investigator maintained a profound respect for the information yielded from the dual methods of observation and experimentation.

THE NEW PSYCHOLOGY IN THE UNITED STATES

In leading the organization of the new science of psychology in the United States, Hall (1844–1924) had no peer. In his long career, he proved to be an effective and durable advocate, writer, and spokesman for psychology and for children in the United States. The story of Hall's career has been expertly told by Ross (1972) and White (1992), with the latter providing fresh insights on Hall's role in science and social policy. Born in Massachusetts, Hall was a minister, professor of philosophy, experimental psychologist, child psychologist, educational psychologist, university president, and

leader of the child study movement. He was also a premier figure in U.S. psychology: the first professor of psychology in the United States (at Johns Hopkins, 1883) and the first president of the American Psychological Association (1891). As is the case with truly effective teachers, Hall had great enthusiasm and tolerance for ideas, and he was a master at conveying his enthusiasm to others. He had a large vision for psychology and its destiny in creating better persons and a more perfect society.

But how did he fare as a scientist and a theorist in the light of history? In the previous edition of the *Handbook,* this chapter concluded that Hall had a large influence on the growth and organization of the new psychology in the United States, and that he provided a foundation for the scientific study of children and adolescents. It was concluded that Hall's own research contributions were modest and his theoretical proposals were flawed by being too tightly woven to the informed beliefs of his day and too loosely linked to empirical data. The grand vision of the science that he offered had only modest substance. After spending several years carefully sifting the evidence, Sheldon White (1992) has arrived at a radically different conclusion regarding Hall's contributions. He observes:

> Recent writings usually picture Hall as a functionary and figurehead, condense his ideas into a few slogans, quote criticisms of his work by his often rivalrous peers, and effectively concede Hall his administrative trophies while ignoring most of what he had to say. (p. 33)

Some did listen to what Hall had to say because, like Mark Hopkins, his mentor at Williams College, he was a masterful teacher (White, 1992). Lewis Terman, Arnold Gesell, and E. C. Sanford were strongly influenced by Hall in their graduate training at Clark University. John Dewey, James McKeen Cattell, and Joseph Jastrow took courses from Hall at Johns Hopkins. Others—including Earl Barnes, who initiated investigations of children at Leland Stanford Junior University in the 1890s—were attracted to Hall's method and perspectives through the child study movement (Goodwin, 1987; Zenderland, 1988). These scientists helped shape the face of twentieth-century psychology in the United States.

Hall's introduction to developmental psychology occurred in 1880, when he returned to the United States from postdoctoral study in Europe with Wundt. He brought with him from Germany the "questionnaire method" to study "the contents of children's minds." The method was initially aimed at helping teachers learn what concepts children had available at the time that they entered school. The procedure involved asking children brief questions about their experiences and about the meaning of words—for example, "Have you ever seen a cow?" or "Where are your ribs?" The answers were scored right or wrong, and the percentage correct was used to describe groups of children, not individuals. Rural children were compared with city ones, boys with girls, Black children with White ones, and so on. The questionnaire method, at least in terms of the kind of questions asked, was a precursor of later general aptitude tests of general information and vocabulary. In Hall's core investigation, children just entering school in Boston were asked some 134 questions, such as those given above. Data collection was voluminous but haphazard; about half of the protocols from the 400 children tested had to be eliminated.

In commenting on this research, White (1992) writes:

> The questionnaire work was methodologically weak, to be sure, but the methodological regulations psychology subsequently put into place have probably been excessively restrictive. Hall's questionnaires asked people to give narrative accounts of children's behaviors in everyday situations, and this kind of approach is becoming more popular nowadays. (p. 33)

The point is well taken. Educators were impressed by Hall's vision of how scientific research had the potential to revolutionize educational practices (Hall, 1883, 1891). Zenderland (1988) suggests that the main impact of the child study movement on psychology was to pave the way for the acceptance of clinical psychology.

Hall's opportunity to shape the direction of psychology in the United States came when he was offered the first professorship in psychology in the United States, at Johns Hopkins University in 1884. He had been selected over C. S. Peirce and G. S. Morris—no modest competition. Peirce is viewed by many to be the preeminent U.S. philosopher, and Morris was a "brilliant lecturer" (White, 1992). Following the general model established by Wundt at Leipzig, Hall set up a teaching laboratory at Hopkins and recruited to it several young persons who were later to play a formative role in the development of the science. In the first laboratory course, the students included John Dewey, James McKeen Cattell, Joseph Jastrow, and E. H. Hartwell. With the support and encouragement of Johns Hopkins president D. Gilman, Hall also established the first psychological journal in

the United States, the *American Journal of Psychology.* On the basis of his success at Hopkins, Hall was offered in 1889 the opportunity of shaping a university himself by serving as first president of Clark University. Hall remained at Clark until his death in 1924, and established there a tradition of developmental study that remains strong today.

In the spirit of *Naturphilosophie,* Hall applied the biogenetic law to all aspects of human development. For Hall, the implications for the education, rearing, and religious instruction of children were manifold. He warned about the hazards of "unnatural" and "artificial" constraints on learning and early development, and expressed disdain for parents and teachers who attempt to instruct children rather than permitting their natures to unfold. According to Hall's view of recapitulation, behaviors, like morphological structures, follow an invariant course of development that has been determined by ancestral evolutionary progression. Interference with that natural process would be detrimental, and likely to bring about a stunting of growth or "developmental arrest."

Hall's biogenetic framework led him to a focus on the phenomena of adolescent development. In behavior, the fast-forward replay of ancestral psychological characteristics ended in adolescence, and the individual became free to superimpose distinctive and individual talents on the predetermined developmental sequence. Hence, it should be the stage of greatest plasticity and possibility for change. As Hall (1904) put it:

> While adolescence is the great revealer of the past of the race, its earlier stages must be ever surer and safer and the later possibilities ever greater and more prolonged, for it, and not maturity as now defined, is the only point of departure for the super anthropoid that man is to become. (vol. 2, p. 94)

Hall's designation of adolescence as the time when the child begins a fresh set of tracks was optional. Other recapitulation theories propose that the adding on of unique features occurs in the early postnatal period, or even prenatally (see Gould, 1977, for an informed discussion of the matter). Convinced that the adolescent period was the nuclear one for the fulfillment of human potential, Hall (1904) prepared a two-volume compendium entitled *Adolescence: Its Psychology and Its Relations to Physiology, Anthropology, Sociology, Sex, Crime, Religion, and Education.* The book offered a broad sweep of citations from philosophical, physiological, anthropological, religious, and psychological sources. Where the data fell short, Hall offered speculative evolutionary and moralistic interpretations. The product was impressive in scope and uneven in logic and scientific rigor.

But it was often on target. Some of the insights and discussions appear remarkably modern in content if not in tone. On social cognition and developmental changes in attitudes, Hall (1904) wrote:

> Children's attitude toward punishment . . . tested by 2,536 children (ages 6–16) showed also a marked pubescent increase in the sense of the need of the remedial function of punishment as distinct from the view of it as vindictive, or getting even, common in earlier years. There is also a marked increase in discriminating the kinds and degrees of offenses; in taking account of mitigating circumstances, the inconvenience caused others, the involuntary nature of the offense and the purpose of the culprit. All this continues to increase up to sixteen. (vol. 2, pp. 394–395)

Similarly, in a discussion of moral reasoning, Hall (1904) concluded: "Thus with puberty comes a change of view-point from judging actions by results to judging by motives" (vol. 2, p. 394). The statement was also based on empirical data using a reformed version of the questionnaire method. In this context, Hall cites Schallenberger's study (1894) on the development of moral judgments:

> From one thousand boys and one thousand girls of each age from six to sixteen who answered the question as to what should be done to a girl with a new box of paints who beautified the parlor chairs with them with a wish to please her mother, the following conclusion was drawn. Most of the younger children would whip the girl, but from fourteen on the number declines very rapidly. Few of the young children suggest explaining why it was wrong, while at twelve, 181, and at sixteen, 751 would explain. The motive of the younger children in punishment is revenge; with the older ones that of preventing a repetition of the act comes in; and higher and later comes the purpose of reform. With age comes also a marked distinction between the act and its motive and a sense of the girl's ignorance.[5] (vol. 2, pp. 393–394)

[5] Twenty-two thousand subjects? Not really. Schallenberger's (1894) article in the *Pedagogical Seminary* actually reported the responses of 3,434 girls and boys who were 6 to 16 years of age. The misinterpretation arose because Schallenberger transformed their responses to proportional scores, then multiplied by 1,000 to permit comparisons between age-sex groups. Nonetheless, a sample of 3,434 boys and girls is

Adolescence thus is "the stage when life pivots from an autocentric to an heterocentric basis" (vol. 2, p. 301).

So far, so good, except Hall had the misfortune of discovering the biogenetic law at about the time that the new generation of biologists was discarding it. If evolution and recapitulation ranked high on Hall's psychological priorities, then morality and religion ran a close second. The linkages came about in ways that were not always immediately obvious but that seemed to represent his faith in the psychic "continuity throughout the universe" (vol. 2, p. 208).

How does one evaluate Hall's contributions to developmental psychology? It is almost true to say that they were unique. Kessen (1965) provides a perceptive and succinct summary: "There have been diggers in the sand pile of child study since him, but in a sense, Hall has had no descendants—only heirs" (p. 151). More recently, White (1992) concluded that Hall made three significant contributions:

1. Hall provided a "first cooperative 'normal science' of child development" through his questionnaire program. The point is that the questionnaires, although limited as scientific instruments in the ways that Hall employed them, had great potential for describing children's lives in natural context.
2. Hall viewed social participation as a catalyst for internal organization, and thereby provided a "social-biological" conception of childhood.
3. Hall was guided by the need "to arrive at a scientific synthesis on the one side and practical recommendations on the other."

Related to the third point, one contribution should not be overlooked because it has potentially large implications for both developmental theory and intervention models. Hall focused on adolescence because he believed it was a period of great vulnerability and the time when novel actions and beliefs were established and consolidated, for good or for ill. In his view, infants and children were more or less buffered, a belief shared by his student Arnold Gesell (see below). Although Hall's reasoning about recapitulation was clearly off base, his intuitions about developmental plasticity in adolescence were inventive and provocative.

Hall also expanded the boundaries of the academic discipline and stimulated fresh approaches to it. Of special importance was his pivotal role in the organization and support of the activities of the child study movement in America, including the Child Study Section of the National Education Association.

In his scientific role, Hall was more an importer and translator of scientific methods and theories than he was a creator of them. In addition to the questionnaire method and the biogenetic law, Hall helped bring Wundtian experimental procedures and Preyer's volume on *The Mind of the Child* (Hall wrote the foreword to the U.S. translation) to the United States. He also helped change the face of U.S. psychology when, in 1909, he arranged a meeting between Sigmund Freud and his lieutenants (C. G. Jung, A. A. Brill, E. Jones, and S. Ferenczi) and the most prominent psychologists in North America. This meeting was held to commemorate the 20th anniversary of the founding of Clark University, and it is generally viewed as a key event in the acceptance of psychoanalysis in North America at a time when Freud felt ostracized by the European scientific establishment. In the same year, Clark University presented an honorary degree to William Stern, another significant pioneer in the establishment of developmental psychology. Throughout his career, Hall remained open to new and fresh approaches, and he promoted efforts to make psychology more useful and relevant to society.

In sum, Hall was a remarkable teacher and catalyst for the field. Some of the most significant areas of developmental study—mental testing, child study, early education, adolescence, life-span psychology, evolutionary influences on development—were stimulated or anticipated by Hall. Because of shortcomings in the methods he employed and the theory he endorsed, few investigators stepped forward to claim Hall as a scientific mentor. His reach exceeded his grasp in the plan to apply the principles of the new science to society. Psychology's principles were too modest, and society's problems were too large. Perhaps we should use a fresh accounting to judge Hall's contributions, one that takes into account the multiple facets of his influence on individuals, the discipline, and society. The audit would reveal that all of us who aspire to better the lot of children and adolescents can claim him as a mentor.

MAKING DEVELOPMENTAL THEORY

Any account of the scientific study of cognitive and social development must take note of the singular contributions of James Mark Baldwin (1861–1932). His role as an

impressive in any era, especially before the invention of computers, electric calculators, and mechanical pencils.

intellectual leader of the emergent discipline is now well established. Baldwin's *Mental Development in the Child and the Race* (1895) was one of the first attempts to construct a genetic epistemology within the framework of the "new psychology" (Broughton & Freeman-Moir, 1982; Cairns & Ornstein, 1979; R. H. Mueller, 1976). The companion volume, *Social and Ethical Interpretations of Mental Development* (J. M. Baldwin, 1897/1906), was the first systematic effort by a psychologist to use developmental ideas to bridge the gap between the study of social institutions (i.e., sociology) and the study of individual functioning (i.e., psychology).

Recent scholarship has compared Baldwin's proposals with those of Jean Piaget. In this regard, Wozniak (1982, p. 42) writes:

> Baldwin proposed a biosocial, genetic theory of intelligence, a theory of mind in the broadest sense, which was conceptually far ahead of his time. This theory contained within it, en germe, many of the most important concepts of the biological theory of intelligence and of the genetic epistemology which Piaget was to develop.

Other studies show direct lines of descent of key ideas and concepts expressed by Baldwin to those commonly associated with Piaget and Vygotsky (Broughton, 1981; Cahan, 1984; Valsiner & van der Veer, 1988; Wozniak, 1982). But it would be a mistake to view Baldwin's thinking only through a Piagetian or Vygotskian lens. Baldwin's distinctive ideas on evolutionary epistemology, cross-generational transmission of developmental accommodations, the dynamics and social embeddedness of personality, and the dual genesis of cognition are sufficiently provocative to demand study in their own right.

Baldwin is less of a "shadowy figure" now than he was just 20 years ago (Broughton & Freeman-Moir, 1982, p. 2). Baldwin was born in 1861 in Columbia, South Carolina, and died in 1934 in Paris. Following undergraduate training in philosophy and psychology, and a year of advanced study in Europe (including a semester in Leipzig with Wilhelm Wundt), Baldwin completed a doctorate at Princeton University in 1888. In the 4 years that he was on the faculty at the University of Toronto, he founded an experimental laboratory and began a research program on "infant psychology." The results of this work, which were published in the journal *Science* 100 years ago, dealt with the ontogeny of movement patterns, handedness, color vision, suggestibility, and research methodology (J. M. Baldwin, 1890, 1891, 1892, 1893). These findings provided the empirical basis for his first major work on mental development.

From the beginning, Baldwin was more a theoretical psychologist than an experimental one. He employed research findings to illustrate theoretical principles rather than to systematize empirical phenomena. Primary in Baldwin's thinking was the "conviction that no consistent view of mental development in the individual could possibly be reached without a doctrine of the race development[6] of consciousness—that is, the great problem of the evolution of mind" (Baldwin, 1895, p. vii). In this conviction, he followed the theoretical lead of Herbert Spencer in philosophy and George John Romanes in biology, and the empirical lead of Wilhelm Preyer and Alfred Binet. After this intensive but brief involvement with the experimental investigation of infants, Baldwin returned to issues of psychological and evolutionary theory, historical commentary, editorial activities, and philosophical construction and systemization. The study of development was no longer an empirical activity for him, but questions of psychological genesis remained at the core of his theoretical and philosophical speculations.

He was a key figure in the organization of psychology as a science, the establishment of three of its basic journals (*Psychological Review, Psychological Bulletin,* and *Psychological Abstracts*), and the founding of two major departments of psychology (at the University of Toronto and Princeton University) and the reestablishment of a third (at Johns Hopkins University). He served as one of the first presidents of the American Psychological Association when he was only 36 years of age. He won the highest honors available to psychologists in his day, including the Gold Medal of the Royal Academy of Denmark and the first honorary Doctorate of Science degree awarded by Oxford University. It is now generally acknowledged by those who have reviewed the record that Baldwin stands alongside William James, John Dewey, and C. S. Peirce as one of the primary intellectual forces involved in the founding of U.S. psychology as a science.

Metaphysics and Development

In an excellent analysis of the structure of Baldwin's thought, Wozniak (1982) writes, "Baldwin had deep intellectual roots in the 'mental philosophy' tradition

[6] *Race development* is one of the unconventional expressions employed by Baldwin. Race in this context refers to variations across the human species. In effect, cross-cultural studies of the development of cognition are required to complement studies of individual development in humans.

which dominated American higher education during the nineteenth century" (p. 13). Yet, he early gained a respect for the emerging biological and behavioral sciences, and the possibility that there might be a scientific explanation for the origin of knowledge and the perception of reality. At the outset of his career, Baldwin explicitly oriented his empirical and theoretical work toward a synthesis of metaphysics and psychological science (Wozniak, 1982, p. 14). In the early 1890s, he became convinced that genetic study must be the central theme for the synthesis of reason and reality.

Throughout the remainder of his career, "the great topic of development itself" (J. M. Baldwin, 1895, p. x) dominated his work and thinking. In his day, Baldwin expanded the application of genetic concepts in three emergent disciplines—psychology, evolutionary biology, and sociology—and in one established discipline—philosophy. Baldwin's own scientific life illustrates his view that cognitive development is not limited to childhood. As Wozniak (1982) observes:

> Baldwin was himself subject of a series of intellectual transformations. So great, in fact, are the differences in conceptual structure and content among his major books . . . that one wonders if perhaps there might not have been three Baldwins at work: a mental philosopher (roughly to 1889), an evolutionary psychologist (approximately 1889–1903), and an evolutionary epistemologist (1903–1915). (p. 14)

Although Wozniak's characterization of the marked intellectual transitions in Baldwin's career seems accurate, Baldwin appears to have moved beyond scientific psychology even before the turn of the century, coincident with his work on the *Dictionary of Philosophy and Psychology.* Given the scope and complexity of Baldwin's work, any brief summary is likely to be misleading. Shortcomings in the following account may be corrected by consulting more complete analyses including Wozniak (1982), on the intellectual origins of genetic epistemology; R. H. Mueller (1976) and Valsiner and van der Veer (1988), on the relations between psychology and sociology; and Cahan (1984), on the comparison of the genetic psychologies of Baldwin and Piaget. In addition, various chapters in the previous edition of the *Handbook of Child Psychology* (Mussen, 1983) attempt to place Baldwin's contributions into contemporary and historical context (Cairns, 1983; Harter, 1983; Sameroff, 1983). Then there are the voluminous writings of Baldwin himself, including 21 books and more than 100 articles. Baldwin's own thoughtful summary of his life's work is perhaps the best place to begin (Baldwin, 1930).

Mental Development and Social Ontogeny

The two works of Baldwin that have proved most stimulating to modern developmental psychologists are *Mental Development in the Child and the Race* (Baldwin, 1895), and *Social and Ethical Interpretations of Mental Development* (Baldwin, 1897/1906). The earlier book presented Baldwin's attempt to formulate a "genetic epistemology." In individual development, a key mechanism for bringing about growth in the "cognitive scheme" is the "circular reaction." This invention of Baldwin's is linked to concepts of learning that appeared later and explained how experience could become internalized into habit through recurrent self-stimulation or imitation. A consideration of ontogenesis challenged the then-dominant idea that consciousness was "a fixed substance, with fixed attributes" (Baldwin, 1895, p. 2). He writes with respect to the static conceptions of traditional approaches:

> The genetic idea reverses all this. Instead of a fixed substance, we have the conception of a growing, developing activity. Functional psychology succeeds faculty psychology. Instead of beginning with the most elaborate exhibition of this growth and development, we shall find most instruction in the simplest activity that is at the same time the same activity. Development is a process of involution as well as of evolution, and the elements come to be hidden under the forms of complexity which they build up. . . . Now that this genetic conception has arrived, it is astonishing that it did not arrive sooner, and it is astonishing that the "new" psychology has hitherto made so little of it. (1895, p. 3)

In Baldwin's eyes, development proceeds from infancy to adulthood through stages, beginning with a reflexive or physiological stage, continuing through "sensorimotor" and "ideomotor" stages, and progressing to a stage of symbolic transformations (Baldwin, 1895). Only in the most advanced stage do "syllogistic forms come to have an independent or a priori force, and pure thought emerges—thought, that is, which thinks of anything or nothing. The subject of thought has fallen out, leaving the shell of form" (Baldwin, 1930, p. 23). From its earliest formulation, Baldwin's stage theory of mental development focused attention on process as much as on structure. Many of the terms that he employed—"accommodation," "assimilation," "imitation,"

"circular reaction"—are commonplace in today's textbooks, although it cannot be assumed that Piagetian meanings are necessarily the same as Baldwinian ones.

Social and Ethical Interpretations in Mental Development: A Study in Social Psychology (Baldwin, 1897/1906) appeared only 2 years later. This book is the first work by a U.S. psychologist on social-cognitive development in childhood; it is also the first volume in English that includes "social psychology" in its title (R. H. Mueller, 1976). In this work, the cognitive-stage model is extended to issues of social development, social organization, and the origins of the self. Baldwin (1895) felt that the essential issues of social psychology had been neglected because of the void that existed between the concepts of psychology and sociology:

> And it is equally true, though it has never been adequately realized, that it is in genetic theory that social or collective psychology must find both its root and its ripe fruitage. We have no social psychology, because we have had no doctrine of the *socius.* We have had theories of the ego and the alter; but that they did not reveal the socius is just their condemnation. So the theorist of society and institutions has floundered in seas of metaphysics and biology, and no psychologist has brought him a life-preserver, nor even heard his cry for help. (p. ix)

In social development, there is a "dialectic of personal growth" that progresses from an egocentric receptive stage to a subjective one and, eventually, to an empathic social stage. In Baldwin's (1897/1906) scheme:

> The development of the child's personality could not go on at all without the modification of his sense of himself by suggestions from others. So he himself, at every stage, is really in part some one else, even in his own thought of himself. (p. 30)

Consistent with his emphasis on developmental processes of the self rather than static structures, personality is not fixed by early experience or by genes. Accordingly, "personality remains after all a progressive, developing, never-to-be-exhausted thing" (p. 338). Actions are fluid, dynamic, and responsive to the immediate setting. In Baldwin's (1897/1906) view:

> [The child's] wants are a function of the social situation as a whole. . . . His wants are not consistent. They are in every case the outcome of the social situation; and it is absurd to endeavor to express the entire body of his wants as a fixed quantity under such a term of description as "selfish," or "generous," or other, which has reference to one class only of the varied situations of his life. (p. 31)

The self becomes progressively and inevitably accommodated to others and to the traditions of society. This "social heredity" is mediated through imitation and the operation of an internal circular reaction. From each relationship, there emerges a refined sense of oneself and of others. "The only thing that remains more or less stable is a growing sense of self which include both terms, the ego and the alter" (Baldwin, 1897/1906, p. 30).

Sociogenesis

One other primary developmental concern of Baldwin involves the relations between nature and nurture and the cross-generational transmission of modifications in individual development. In light of the metaphysical synthesis that guided Baldwin's thinking, it was entirely fitting for him to argue that the nature-nurture dichotomy falsely "supposes that these two agencies are opposed forces" and that it fails to entertain the possibility that "most of man's equipment is due to both causes working together" (Baldwin, 1895, p. 77). Evolutionary adaptations and developmental accommodations operate toward the same goals, although they are established over vastly different time intervals. Extending this analysis to the problem of how this synchrony is established and maintained, Baldwin (1895) wrote:

> It is clear that we are led to relatively distinct questions: questions which are now familiar to us when put in the terms covered by the words, "phylogenesis" and "ontogenesis." First, how has the development of organic life proceeded, showing constantly, as it does, forms of greater complexity and higher adaptation? This is the phylogenetic question. . . . But the second question, the ontogenetic question, is of equal importance: the question, How does the individual organism manage to adjust itself better and better to its environment? . . . This latter problem is the most urgent, difficult, and neglected question of the new genetic psychology. (pp. 180–181)

Beginning in his first developmental volume (Baldwin, 1895) and continuing through *Development and Evolution* (Baldwin, 1902), Baldwin expanded on his view of the cross-generational transmission of behavior tendencies through "organic selection." He proposed that "accommodations" that occur in the lifetime of the individual could be transmitted to the next generation in

the form of "adaptations" of the species by means of the process that he labeled "organic selection" (Baldwin, 1895, p. 174). The essence of the idea was that ontogenetic accommodations can serve to direct the course of evolutionary change. How was it accomplished? On this matter, there remains debate on exactly what processes were implicated (e.g., Gottlieb, 1979, 1987; Piaget, 1978; Vonèche, 1982). Baldwin was clearly reaching for a developmental mechanism of directed selection that would supplement the Darwinian concept of natural selection, without invoking "the Lamarckian factor" (i.e., the inheritance of acquired characteristics). Over the years, Baldwin sharpened this concept (J. M. Baldwin, 1930). The proposal became known in biology as the "Baldwin effect" (Cairns, 1983; Gottlieb, 1979), despite Baldwin's large debt to the crisp logic of C. L. Morgan (1896, 1902).

Toward a Critical Evaluation

Since the modernity of Baldwin's theory has become acknowledged, it has seemed reasonable to evaluate its adequacy by modern standards. Certain shortcomings in coherence and expression appear in a cursory examination of his books; other problems demand the examination of the work of Baldwin's contemporaries. Doubtless the most important measure of his theory has to do with its effects on subsequent investigators, including those in the present generation.

Perhaps because of his openness to novel conceptions, Baldwin sometimes evolved the meaning of basic concepts in the theoretical models that he proposed. The relativity of his ideas to time and context renders any static description of his theory misleading. It also confounds comparisons that may be made with his contemporaries and apparent intellectual heirs, including Piaget and Vygotsky.

Baldwin's work illustrated another premise of his theoretical perspective—that an individual undergoes the "constant modification of his sense of himself by suggestions from others" (1897/1906, p. 30). On this score, his early work in mental philosophy was heavily influenced by the metaphysical view of Scottish commonsense philosophy in general and the intuitional realism of James McCosh, his mentor at Princeton (R. H. Mueller, 1976; Wozniak, 1982). During the second period, his research laboratory owed much to the prior work of Preyer, Binet, and Shinn. Similarly, his conceptions of "organic selection" seemed to have drawn much from the work of Morgan (1896) and Osborn (1896). In the work on genetic logic and precision of philosophical definition, Baldwin drew on contemporaries William James and C. S. Peirce in his conception of the task and its execution. Baldwin typically was generous in acknowledging these influences, and thereby highlighted his own distinctive insights and creativity.

Baldwin's writing style and organization were uneven. On some issues, as is illustrated by some quotes in this chapter, he was incisive, powerful, and challenging. He could also, however, be obtuse. William James, one of the few U.S. psychologists who remained friendly with Baldwin, gently remarked, "This article (like much of its author's [Baldwin's] writing) is in places deficit in perspicuity" (James, 1894, p. 210). Other critics were less generous. James Sully, an important British experimentalist and a contemporary of Baldwin, began and ended a review of *Mental Development in the Child and the Race* with the following comments:

> This is a book which presents special difficulties to the reviewer. One looks on a biological work—for such Professor Baldwin's work seems to be quite as much as a psychological one—for arrangement, structure, organic form: in the present case one is struck almost at first glance by the apparent absence of these attributes. And the first impression is by no means dispelled as one begins to read. . . .
>
> To sum up my impression of Prof. Baldwin's book. It seems to me in many respects fresh and stimulating. On the other hand, in what looks like an over-straining after originality apparent newness of conception often turns on closer examination to be but newness of phrasing. *When new ideas are put forward one misses for the most part an impartial and thorough-going confronting of theory with fact.* (1896a, pp. 97, 102–103, italics added)

Unclarity was not limited to this first volume. In comparing Baldwin's discussions of social development with those of C. H. Cooley (1902), Sewney (1945) indicated that "Cooley presented his views in a language that is lucid and readable, and free of the confusing and jumbled terminology that fills the writings of Baldwin" (p. 84). R. H. Mueller located an unpublished journal in which Cooley himself had the following comments on Baldwin's style and motivation:

> A great fault with strenuous writers like Baldwin is that in their eagerness to produce they do not allow time enough for their imaginations to grow naturally and thoroughly

> into the mastery of a subject. They force it, and so impair its spontaneity, its sanity and humanness. What they write may be stimulating, consecutive, attractive for a time, but it is not food to live on. A style like this Goethe calls mannerism or "*das manirierte*." If you wish to produce anything of lasting value, you see to it that the subject matter, the truth, is the first interest of your mind, not your books, your essay, yourself as discoverer and communicator of truth. (R. H. Mueller, 1976, p. 250)

A modern reviewer, otherwise sympathetic to Baldwin, indicated that "there is much in Baldwin's work that is unfinished and confusing" (Broughton, 1981, p. 402). Examples of the unfinished business included theoretical discontinuities in Baldwin's social theory, and internal inconsistencies in the description of stages.

Baldwin's style may have been more than an inconvenience for readers. It permitted him to reform explanations and concepts so that one and the same term could take on fresh nuances or alternative meanings, depending on its context. Imprecision in presentation thereby promotes projection in interpretation. Perhaps this explains the considerable dispute as to what exactly was meant by Baldwin in his use of such terms as *organic selection, imitation,* and *genetic method.*

Baldwin tended to incorporate new ideas into his own developmental view, and he did not always appear to be sensitive to possible contradictions between the new and the old. Baldwin seems to have benefited greatly from Josiah Royce and William James in his concepts of the social self (Valsiner & van der Veer, 1988). He also introduced some of the ideas of Osborn (1896) and Morgan (1896) in his revision of the concept of "organic selection." It was, however, a process of assimilation, not imitation. Most of the ideas were transformed when they became incorporated into a genetic framework. This long-term pattern of intellectual reformulation and reconstruction may account for why Baldwin invented new terms for old ideas and was particularly sensitive to the issue of intellectual priority and ownership. In his eyes, the concepts were new inventions. Priority and recognition were especially important for Baldwin, and this concern may help explain his haste to publish.

To illustrate, consider the concept of *organic selection.* The aim of the concept was clear from the beginning: to link the accommodations that occur in the life history of the individual to the adaptations that occur in the life history of the species. But the identification of the precise mechanisms has proved to be something of a projective test. This is due in part to the assimilation by Baldwin of the terms and logical argument outlined by C. Lloyd Morgan (1896). In a brief but brilliant essay on this matter, reprinted as an appendix in Baldwin's volume on *Development and Evolution,* Morgan (1902) refers to the collaboration of individual modification in development and adaptive variation in phylogenesis as *coincident variations.* The concept of coincident variation was incorporated into Baldwin's account of organic selection, but it was unclear when he accepted the important corollary that there were no direct connections between specific individual experiences in ontogeny and specific variations in phylogeny. Eventually, Baldwin did clarify the concept (Baldwin, 1930).

All this is to say that the contributions of Baldwin did not arise independently of the rich intellectual context in which he lived and drew inspiration. Consistent with his model of social-cognitive development, the influences were bidirectional. There is now ample evidence that a large number of investigators in four disciplines were challenged by Baldwin's proposals and conceptions on development. In his commitment to the concept of development and its systematic application, Baldwin was more persuasive, thoughtful, and persistent than any of his peers, including Hall. He envisioned a new *genetic science* (Baldwin, 1930).

Lawrence Kohlberg deserves credit—more than any other psychologist of the present generation—for having brought the attention of U.S. psychologists to the theoretical contributions of Baldwin. Before Kohlberg's (1969) classic article on social cognition, there was scant recognition among modern developmental psychologists of the extent to which Baldwinian insights have persisted in the discipline. Kohlberg himself studied Baldwin's work independently in graduate school to establish a theoretical framework for his investigation of ethical and moral development. It is therefore fitting that the primary book on Baldwin's theory should be edited by two of Kohlberg's former students (Broughton & Freeman-Moir, 1982) and that Kohlberg's chapter in that volume contained some of its most noteworthy passages. His essay provides a succinct answer to the question: What are the real differences between Baldwin's and Piaget's theories? Kohlberg (1982) writes:

> In the end, the fundamental distinction between Baldwin's moral psychology and Piaget's is that Piaget's psychology has no self. Piaget starts with an ego knowing objects, but

> knowing them first egocentrically. Development is a progressive movement toward objectivity. In contrast, for Baldwin all experience is experience of a self, not just of a bodily and cognitive ego. This means first that central to the self is not cognition but will. Second, it means that from the start experience is *social* and reflective. The child's sense of self is a sense of will and capacity in the relation of self to others. The individual is fundamentally a potentially moral being, not because of social authority and rules (as Durkheim and Piaget thought) but because his ends, his will, his self is that of a shared social self. (pp. 311–312)

It is also an integrative self. Baldwin (1897/1906) himself indicated: "In spite of the large place which I assign to Imitation in the social life, I should prefer to have my theory known as the 'Self' or the 'Self Thought' theory of social organization" (p. xviii).

Baldwin's theoretical work anticipated much of Piaget's theory of cognitive and moral development. Piaget's use of Baldwin's distinctive terms—from circular reaction and cognitive scheme to accommodation, assimilation, and sensorimotor—point to a direct line of intellectual descent. More importantly, as Cahan (1984, p. 128) has observed, "the goals, genetic approach, and epistemological assumptions underlying Piaget's inquiry into cognitive development found explicit statement around the turn of the century in Baldwin's work." The mediational linkages from Baldwin are readily identified. From 1912 to his death in 1934, Baldwin's primary residence was in Paris. His work was well regarded in French intellectual circles in general, and by Pierre Janet in particular. As Piaget wrote to Mueller (1976, p. 244):

> Unfortunately, I did not know Baldwin personally, but his works had a great influence on me. Furthermore, Pierre Janet, whose courses I took in Paris, cited him constantly and had been equally very influenced by him.

There is also a written record in the pattern of Piaget's citations of Baldwin. Curiously, these references appeared in works that were published very early (1923/1926) or very late (1978) in Piaget's career.

It would be a mistake to infer that Piaget's theory was simply a revision of Baldwin's original. As Broughton (1981) and Cahan (1984) have observed, the differences are as great as the similarities. In addition to the insightful distinction made by Kohlberg, there is a large difference in the scientific styles of the two investigators that, in turn, gave rise to marked differences in the content of their approaches. Baldwin used the methods and analyses of experimental psychology to illustrate developmental theory. He learned early that the methods of experimental psychology were inadequate to evaluate the developmental theory that he was constructing. Given this dilemma, he chose to abandon the scientific issues and address the philosophical ones.

Piaget, alternatively, was trained in biology rather than philosophy. As an empirical scientist, he employed observations to understand phenomena rather than merely demonstrate principles. Piaget was challenged to invent methods appropriate to the empirical issues he sought to comprehend. The clinical method of direct observation and the creation of developmentally appropriate tasks provided him with the tools for revising, extending, and evaluating his proposals. They also permitted others to assess the replicability of the phenomena and determine the adequacy of the theory. More important, the objective tracking of phenomena over time permitted Piaget and those who followed his lead to arrive at insights that were not self-evident to experimentalists or armchair observers. The insights, in turn, contributed to the vitality of Piaget's developmental model.

Despite the shortcomings in Baldwin's theoretical system and empirical work, his proposals have nonetheless exercised a large direct and indirect influence on developmental theorists in the twentieth century. As Valsiner and van der Veer (1988) document, there are direct connections between Baldwin's (1897/1906) concepts of the development of the self in social context and George H. Mead's (1934) symbolic interactionism, on the one hand, and L. S. Vygotsky's (1962) propositions on the social-contextual origins of personality, on the other. Baldwin's work was the common denominator, since neither Mead nor Vygotsky referred to the other directly. The Valsiner and van der Veer (1988) analysis is consistent with independent evidence that (a) Baldwin's work had a significant influence on C. H. Cooley as well as Mead, in formulations of symbolic interactionism; and (b) Baldwin's influence on Vygotsky was mediated primarily through Janet's writings. Valsiner and van der Veer (1988) point out that the assimilation of Baldwin's influence was selective. On the one hand, Cooley (1902) and Mead (1934) tended to discard the developmental features of Baldwin's self theory. On the other hand, Vygotsky (1962) preserved both

the ontogenetic focus and the social dynamics of Baldwin's system.

In addressing the issue of what lasting significance Baldwin's developmental concepts may have for the science, we first must ask why they vanished from psychology in the first place. The primary explanation was that Baldwin's theoretical formulations were out of line with the ideas and empirical trends that were to dominate the new U.S. psychology of the early twentieth century. The new psychology was to be dominated by models that either denied the importance of cognition or diminished the importance of development beyond infancy. Moreover, his developmental concepts of the mind and of social processes required research methods that were simply not available to the discipline. The further Baldwin went beyond the study of infancy, the more speculative and removed from data he became. But the fulfillment of his aim—the building of a science of development—demanded a continuing tension between a drive for system and a drive for evidence. As Quine (1981) has observed:

> If either of these drives were unchecked by the other, it would issue in something unworthy of the name of scientific theory: in the one case a mere record of observations, and in the other a myth without foundation. (p. 31)

Baldwin lacked the cadre of colleagues and students to help him translate his developmental ideas into an empirical science. Without adequate methodologies, he became increasingly removed from the validation and correction of his ideas, and, like William James before him, became increasingly drawn to philosophy and away from the empirical issues of developmental psychology.

There were other factors that various writers have felt were important in limiting his influence: (a) his writing style failed to inspire confidence in the validity of his ideas; (b) he failed to produce students who might have continued his work (i.e., in the 5 years that he was at Johns Hopkins, no students completed the doctoral program in psychology); and (c) his severe embarrassment in a personal scandal that became public led to abrupt termination from his academic position at Johns Hopkins in 1909. After that incident, he spent little time in the United States, and his name seems to have been virtually blacklisted by the next generation of psychologists. Each of these events may have contributed to the regression and submersion of Baldwin's concepts in U.S. psychology. Ironically, Baldwin's forced move to Paris may have facilitated the acceptance of his concepts. European psychologists tended to be more receptive to developmental concepts and methods than their U.S. counterparts.

Beyond these contributing factors, the unfinished business in Baldwin's agenda was to create methods, techniques, and analyses that are appropriate for developmental study. Piaget and Vygotsky, who helped establish those methods and revised their concepts in the light of their results, had an enormous impact on modern developmental thinking. Recent methodological critiques have suggested that the systematic study of developmental processes requires not only different statistics, but also different research designs and different ways to organize empirical observations (Cairns, 1986; Valsiner, 1986; Wohlwill, 1973). Furthermore, it was explicit in Baldwin's proposals that the task of disentangling development-in-context was necessarily an interdisciplinary activity that extends beyond the traditional boundaries of psychology. Sully (1896a) was probably correct when he observed that Baldwin's *Mental Development in the Child and the Race* was as relevant to biology as it was to psychology. And R. H. Mueller (1976) was likely accurate when he noted that Baldwin's *Social and Ethical Interpretation of Mental Development* was as relevant to sociology as to psychology.

The broader point is that Baldwin may have failed in his larger goal even if he had written more precisely, recruited more students, and died of old age in Baltimore rather than Paris. He would have failed because he had envisioned a science different from any that could be accommodated by the new psychology. It appears that many of the obstacles that precluded the adoption of developmental concepts into the psychology of the 1890s remain in place.

What might we conclude about James Mark Baldwin? Beyond whatever shortcomings may have existed in his writing and teaching, and beyond whatever honors he coveted and disappointments he endured, he ultimately succeeded in reaching the part of the goal that was within his grasp. He had insight and vision to describe developmental ideas that continue to inspire and challenge after 100 years.

DEVELOPMENTAL PSYCHOPATHOLOGY

Sigmund Freud (1856–1939) stood in curious relationship to the founding of developmental psychology. Un-

like the other investigators covered in this section, Freud published no empirical research on behavioral development: He observed few children in a clinical setting, and none in a traditional experimental design. Yet, psychoanalysis has emerged as one of the more important influences—if not the most important—for developmental psychology in the twentieth century. Further, the early acceptance of psychoanalysis in the United States and elsewhere was due in part to the enthusiasm of Hall. As Freud (1926/1973) himself described the emergence of the psychoanalytic movement:

> In 1909, Freud and Jung were invited to the United States by G. Stanley Hall to deliver a series of lectures on psychoanalysis at Clark University, Worcester, Mass. From that time forward interest in Europe grew rapidly; it showed itself, however, in a forcible rejection of the new teachings, characterized by an emotional colouring which sometimes bordered upon the unscientific. (vol. 18, p. 720)

Hall recognized a novel developmental idea when he saw one. His promotion of psychoanalysis occurred at a time when it was suffering rejection in Europe and obscurity in North America. Freud's (1910) lectures at Clark, published in Hall's *American Journal of Psychology,* remain one of the most lucid and succinct presentations of psychoanalysis by its founder.

Born in Moravia and raised in Vienna, S. Freud as a student showed the catholicity of interests that was to appear in his mature work. Though anatomy and physiology were his primary areas of concentration, he was greatly impressed by the work of Darwin and Haeckel, on the one hand, and by the ideas of British associationist John Stuart Mill, on the other. After completing medical studies, Freud engaged in neurobiological research for several years, initiating, among other things, a phyletic-ontogenetic analysis of the fetal brain and the mapping of sensory neural tracts. Freud's early physiological publications were well received, and he achieved international recognition as a highly promising researcher and methodologist.

The mid-1880s constituted a turning point in his career when he decided to practice neurology, in part for economic considerations, according to E. Jones (1953). To further his training in this specialty, Freud won a fellowship to study in Paris with the renowned neurologist, J. M. Charcot. From October 13, 1885, until February 28, 1886, Freud thus worked in the facilities at the Salpêtrière and, presumably, shared some of the same interests as Alfred Binet. Apparently both young men were attracted by Charcot's demonstrations of the interrelations between physical symptoms and the mind, including the use of hypnotism in the remission of hysteric symptoms and in probing the "unconscious" mind. Binet, characteristically, was the first of the two to publish on issues of sexual perversions and their origins. In a remarkable yet almost forgotten paper titled "*Le Fétichisme dans l'Amour,*" Binet (1887) described the ease with which sexual attractions and impulses could be associated with neutral objects, and the "abnormal" could be brought about by normal mechanisms of associative learning. In this paper in an early volume of the *Revue Philosophique,* Binet anticipated three of the major themes identified with psychoanalysis; namely, (1) the continuity between mechanisms that regulate normal and abnormal behaviors and emotions, (2) the significance of sexuality in psychopathology, and (3) the essential lawfulness of human behavior.

Returning to Vienna, Freud began his neurological practice, leading to a collaboration with Josef Breuer in the writing of *Studies in Hysteria* (1895/1936). When Freud substituted free association and dream analysis for hypnotism in reaching the unconscious, psychoanalysis was invented.

Might Binet's concepts of unconscious have contributed to the psychoanalytic movement? In a remarkable passage in Breuer and Freud (1895/1936), we find:

> The continuation of the hysterical symptoms which originated in the hypnoid state, during the normal state, agrees perfectly with our experiences concerning posthypnotic suggestions. But this also implies that complexes of ideas incapable of consciousness co-exist with groups of ideas, which function consciously; that is to say, there is a *splitting of the psyche.* . . . It seems certain that this too can originate without hypnoidism from an abundance of rejected ideas which were repressed, but not suppressed from consciousness. *In this or that way here develops a sphere of psychic existence, which is now ideationally impoverished and rudimentary, and now more or less equal to the waking thoughts, for the cognition of which we are indebted above all to Binet and Janet.* (p. 188, emphasis added)

One reason that the Binet-Janet-Freud linkage has been heretofore overlooked may be that A. A. Brill failed to include this section in his earlier English translation of *Studies in Hysteria* (i.e., before 1936). A mere oversight? Perhaps, but Sulloway (1979) proposes a less benign interpretation of selective recall and biased citations in psychoanalysis. He asks, "Why is the history

of intellectual revolution so often the history of conscious and unconscious attempts by the participants to obscure the true nature and roots of their own revolutionary activity?" (p. 6). His answer is that there "generally exists a powerful underlying tension between the forward-looking orientation of the would-be discoverer and the backward-looking orientation of the historian" (p. 7). Innovation, novelty, and discovery are the stuff out of which new scientific movements are created. There is strong temptation to ignore or denigrate research and researchers who threaten the illusions of novelty or validity—despite a commitment of the scientist to balanced and thorough scholarship. Although psychoanalysis illustrates this temptation, it hardly constitutes a unique case in the past of developmental psychology.

As Freud (1926/1973) has pointed out, psychoanalysis "in the course of time came to have two meanings: (a) a particular method of treating nervous disorders and (b) the science of unconscious mental processes, which has also been appropriately described as 'depth psychology' " (p. 720). Psychoanalysis, the theory, involves strong assumptions about the development and evolution of personality that psychoanalysis, the method and therapy, does not. Why did psychoanalysis-as-theory emerge as a developmental one?

One answer would be that it was demanded by the data. The roles of, say, infant sexuality and the primacy of early experiences would be seen as having been revealed by the use of psychoanalysis-as-method. A second possibility, not incompatible with the first, is that Freud may have been intellectually prepared to focus on the formative nature of ontogenetic events by virtue of his research training and experience in neurobiology. Recall that Freud had, in his physiological work, undertaken analyses of embryogenesis. Finally, broader intellectual-scientific forces appear to have been at work. As Gould (1977) and others have noted, parallels to the then-contemporary evolutionary developmental assumptions seem to be liberally represented throughout psychoanalytic thought. That Freud should draw on biological approaches in the formulation of his theory of personality and psychopathology seems entirely reasonable, in light of his scientific training in the area.

Contrary to the view that Freud employed physics as the basic model for psychoanalysis, the theory seems more analogous to the biological thought of the day than to either "physical" or even "medical" models. Hence, certain psychoanalytic propositions appear to be immediately parallel to Darwinian-Haeckelian proposals on development and evolution. These include: (a) the never ceasing intrapsychic struggle and competition among instincts for survival and expression; (b) the psychoanalytic focus on two immanent motivational forces that figure importantly in evolution-instincts that bring about reproduction (sexual, libido), and instincts that bring about selection and destruction (aggression, Thanatos); (c) the assumed preestablished progression of the stages of ontogenesis that parallel the stages of phylogenesis, hence the appearance of sexual expression in human infancy; and (d) the notion of developmental arrest or fixation, an idea introduced into recapitulation theory to account for fetal teratology, whereby "monsters" would be produced if the ancestral stages of phyletic evolution were not permitted to be sequentially produced in individual development.

Later, in *Moses and Monotheism* (1939), Freud makes his debt to the biogenetic law explicit. As we have already seen, the primary U.S. psychological recapitulationist, Hall, recognized the fundamental harmony of his ideas on development and evolution with those of psychoanalysis.

The methodological legacy of psychoanalysis requires comment. Freud's main endeavor in life, according to Freud himself, was "to infer or to guess how the mental apparatus is constructed and what forces interplay and counteract it" (E. Jones, 1953, vol. 1, p. 45).

The inferences on development and infantile experiences were colored, in large measure, by statements and reconstructed memories of his adult neurotic patients. It was a narrow data base, hardly adequate to construct a theory of normal development. But Freud had an advantage that most other theorists of his day (and these days) did not have: He, like Binet, was permitted the opportunity to study complex processes in "persons whom we know intimately." Psychoanalysis thus evolved from the exhaustive observation of single individuals over a long-term period, including Freud's own self analysis. Theory construction and its evaluation thus proceeded on an idiographic basis, following a research strategy not unlike the method he found effective in his earlier physiological studies.

If the contributions of investigators who employed the idiographic method are any indication—Preyer, Binet, Baldwin, Lewin, Piaget—then the procedure seems not wholly without merits. But there are pitfalls. While Binet argued that it was necessary to work back and forth—verifying and testing one's hypotheses at both levels of

analysis—Freud eventually expressed a disdain for systematic experimental work, and the validity of the results it produced. For instance, in response to what seemed to be the experimental demonstration of repression in the laboratory, Freud observed: "I cannot put much value on these confirmations because the wealth of reliable observations on which these assertions rest makes them independent of experimental verification" (cited in Shakow & Rapaport, 1964, p. 129). Freud had earlier held that the rejection of psychoanalytic teachings had been for "emotional" and "unscientific" reasons. Here the suggestion appears to be that they should be accepted on the same grounds. In time, the validity of psychoanalytic assertions came to be evaluated by dogma, not by data. That's a pity on two counts. First, the history of developmental research indicates that Freud was correct in holding that idiographic methods are no less "scientific" than are nomothetic ones, though the more enduring advances have occurred when the two methods have been coupled. Second, the scientific status of the entire area was compromised when it became permissible to denigrate the value of a conclusive empirical observation or experiment if it happened to be in conflict with a kernel hypothesis.

In any case, psychoanalysis has thrived for 100 years in science and society. Its direct impact upon the health and social sciences and literature cannot be overestimated. As a scientific orientation, the breadth of its roots in the evolutionary-developmental thought of Darwin and Haeckel, on the one hand, and the psychological associationism of J. S. Mill and British empiricism, on the other, made it especially susceptible to hybridization. For example, psychoanalysis-as-theory was as readily married to the hypothetico-deductive behavioral model of C. Hull as it was to the ethological theory of K. Lorenz and N. Tinbergen. Both syntheses—social learning theory and attachment theory—have proved to be exceedingly influential in developmental research, a matter that we revisit.

One kernel assumption that has made psychoanalysis particularly attractive to developmentalists has been its focus on the very early years as formative and determinative. The events of infancy and early childhood are presumed to provide the foundation for adult personality and psychopathology. This broad assumption demands research on infancy and early childhood and on the events that occur in the familial relationships. Ironically, the assumption also implies that the events that occur later in ontogeny—during childhood and adolescence and early adulthood—are necessarily less plastic and malleable, hence less critical for understanding personality and psychopathology. Psychoanalysis is a developmental theory, up to a point. Hence, childhood is seen as the "latency" period, and adolescence is viewed as a period of activating the propensities and conflicts of the earliest years. The goal of much research in this tradition has been to demonstrate that there are strong continuities from infancy and the preschool period throughout childhood, adolescence, and early adulthood.

There is a formal similarity between psychoanalysis and most of its descendant theories—including object relations theory and attachment theory—in that the principal dynamic processes of development are restricted to the earliest years. Once these personality dispositions and structures become established and fixed, other nondevelopmental processes come into play. Under very special circumstances, such as psychoanalytic therapy, later interventions are possible. As Fenichel (1945) observes, the transference relationship in psychoanalysis is seen as a reconstructive psychiatric intervention where the fixations and conflicts of infancy and childhood are relived and repaired.

The broader point is that psychoanalysis and its descendant models implicate developmental processes—reciprocal interaction, bidirectionality, behavioral plasticity, biobehavioral organization—only up to a critical point in ontogeny. In the usual case, this point is infancy or very early childhood. These developmental processes become less active and less relevant, and the personality structures and dispositions that they produced govern the nature and quality of the individual's adaptations throughout the life course.

OTHER TRENDS IN SCIENCE AND SOCIETY

Psychoanalysis clearly played the leading role in setting the agenda for future studies of developmental psychopathology, but other, nearly forgotten forces were operating to link psychology and society. One notable event, particularly relevant to child study, was the opening of the first psychological clinic in the United States. It was founded in 1896 at the University of Pennsylvania under the direction of Lightner Witmer, a former student of Wundt and Cattell.

The aim of Witmer's work was to assist in the diagnosis and treatment of children with school problems,

and to apply the principles of the newly established science to everyday concerns. What were those principles? In Witmer's view, the study of children required a multidisciplinary approach, and from the beginning he brought together different professions, including social workers, physicians, and practicing psychologists. In the absence of a treatment model, he created one. Although the clinic was essentially a local Philadelphia operation, it grew and prospered under Witmer's leadership, and a journal, the *Psychological Clinic,* was founded to describe its activities. The concept of an applied psychology, as well as a clinical psychology, caught on, and one of the students from Witmer's group at Pennsylvania, Morris Viteles, led the way in the establishment of industrial psychology in America (Viteles, 1932).

Developmental Theory

From 1900 forward, when theoretical activity in developmental psychology was on the wane in the United States, it began to thrive in Europe. Following the impetus provided by Preyer, developmental work in German-speaking countries expanded, with the young William L. Stern (1871–1938) playing a leading role. Stern was instrumental in extending the theoretical and institutional foundations of the new science in Germany from the turn of the century through the early 1930s (Kreppner, 1992). In 1909, he was sufficiently prominent in the discipline that he was awarded an honorary degree from Clark University.

Kreppner (1992) has recently argued that Stern should be viewed as the peer of Preyer, Binet, Freud, Hall, and Baldwin as a pioneer in developmental psychology. Remembered in U.S. psychology mostly for his proposal that the mental ages could be converted into an intellectual quotient (J. Peterson, 1925; Stern, 1911, 1914)—a transformation that was designed to equate intelligence scores across chronological ages—little systematic recognition has been given to his fundamental role in establishing three areas of psychology as scientific disciplines: (1) differential psychology, (2) personality psychology, and (3) developmental psychology. Stern's influence is seen in the ideas on development that he generated, in the institutions he created, and in the students whom he influenced, including Heinz Werner and Martha Muchow.

Although he completed his dissertation with Hermann Ebbinghaus, Stern saw early that the study of human development required a unified perspective (Kreppner, 1992). In this regard, Binet and Henri (1895) had earlier confronted the dualism between elementarism and holism in understanding children's cognitive functioning and problem solving. In the same spirit:

> [Stern criticized] the view that psychological elements are carriers of psychological forces . . . a person's actions are defined not by single elements but by the entire structure of environment, person, and person-environment interaction. Thus, a wholistic view was one of the fundamental bases from which Stern constructed his person-oriented theoretical framework. (Kreppner, 1994, p. 317)

Consistent with the dialectic philosophy, Stern described the tug-of-war between personal dispositions and environmental constraints in development. This brings up the issue of how plastic or malleable are actions in ontogeny. The individual is a complex unit that is not entirely determined by the forces within or the forces without. In this regard, Stern wrote:

> This is the fact of personal plasticity or malleability, a domain of intentional education or unintentional influences of the milieu. This domain is narrower than many empiricists might be aware of. For the person is not only a passive recipient of the environmental forces impinging on him, but he is also reacting to these forces. The way he shapes and keeps a kind of plasticity is not only a symptom of the conflict between activity and passivity, it is also a tool for overcoming it: It is a mirror which is a weapon at the same time. (W. Stern, 1918, pp. 50–51, quoted from Kreppner, 1994, p. 318)

But it should be recalled that a dialectical systems perspective is not necessarily a developmental perspective. Stern's dual interest in development and individual differences presents a dilemma. The inclusion of developmental change in any discussion of characteristics of the self—traits and types—adds fresh complications. The theoretical task is to resolve the tension between changing, adaptable features that promote fresh adaptations, and enduring, permanent features that provide for predictable individual differences. On this score, the proposal of the IQ ratio held age constant and focused on individual differences; it represented the differential assessment, nondevelopmental side of Stern's thinking. His students represented both features of Stern's thought, from the nondevelopmental representations of topographical theory (Lewin, 1935) to the thoroughly developmental concepts of mental development and symbolic transformation in Werner (1940/1948).

His influence extended even beyond the boundaries of recent retrospectives. Through the work of Gordon Allport, Stern's ideas became prominently represented in the classic volume *Personality* (Allport, 1937). Stern's strong influence is seen in Allport's concepts of the holistic nature of personality organization and functioning, and idiographic and nomothetic models. In the study of individual differences, Stern literally wrote the book, authoring one of the first systematic texts on differential psychology (1911), a volume that is still admirable in its precision and clarity.

After establishing and directing the Psychological Institute at Hamburg University, Stern was expelled from Germany in 1933 by the Nazi regime. He came to the United States in 1934, was appointed in the Department of Psychology at Duke University, and died in Durham, North Carolina, in 1938. As in the case of J. M. Baldwin, his ideas have survived, but his name recognition temporarily lapsed.

Child Study

In France, developmental work progressed in brilliant leaps in education and became bogged down in the universities. Binet himself was rejected in his three attempts to secure an academic appointment as chairs became open at the Sorbonne and the Collége de France. He died without having been named to a professorship in France, despite his preeminent role in the establishment of psychology as an empirical science. Binet's founding of a laboratory for the experimental study of educational problems inspired E. Claparéde's establishment of the J. J. Rousseau Institute in Geneva.

In England, James Sully (1896b) and William Drummond (1907) produced influential textbooks on psychology and on development, although there was relatively little novel research being conducted on children (but see McDougall, 1906–1908). In this regard, Mateer (1918) observed that "on the whole English contributions to child study, in so far as it deals with the child of preschool age, have been imitative rather than original and very scanty in number" (p. 28). Additionally, the contributions of Hall were being brought back to Europe whence they had originated. The British Child Study Association, in England, and the Society for the Psychological Study of the Child, in France, were two of the more influential groups modeled after Hall's U.S. association. Comparable developments were occurring in Italy, Russia, Denmark, and Portugal, but these events were relatively remote from the mainstream of ongoing developmental work and thinking. They soon were to become less remote with the importation by Mateer (1918) of classical conditioning methods for studying learning in infants and children.

From 1890 onward, North America joined Europe as a primary center for the scientific study of children. Millicent Shinn's "Notes on the Development of a Child" appeared in 1893 and led to a renewed interest in individual studies. At the time, her replication and extension of Preyer's method was considered to be a "masterpiece" (Mateer, 1918).

Development and Education

The work of Binet, Hall, and Stern has underscored the intimate linkage between basic developmental research and educational practice. These investigators became psychologists, however, and they focused on developmental phenomena in their research and their writings on education. It was a different course with John Dewey. Cahan (1994) notes in her review of Dewey's contributions to the science:

> Education was Dewey's most enduring, comprehensive, and synthetic philosophical problem and the one for which he became best known. His interest in education "fused with and brought together what might otherwise have been separate interests—that in psychology and that in social institutions and social life." (p. 146)

Influenced by the neo-Hegelianism of George S. Morris and W. T. Harris, on the one hand, and the pragmatism of C. S. Peirce and William James, on the other, Dewey evolved a distinctive view of education that focused on the social circumstances of the child. The dialectic between the child and the environments in which he or she lived and adapted was key to understanding the nature of development. In this framework, schools became the natural settings for the study of development.

Dewey held that the experiences of children in school could prepare them to develop those intellectual and moral virtues that would establish a better society (Dewey, 1916). How is this to be achieved? According to Dewey, the subject matter of education should not be imposed by the agenda of the adult but should be drawn from the child's immediate environment and from the child's current interests. The task then would be to begin with the child's needs and concerns, not the teacher's.

Sound familiar? These ideas were in the air in the early decades of the twentieth century. The Baldwin-Piaget concepts of accommodation and assimilation were first cousins to the idea that there is a "constant reorganizing and restructuring of experience" (Dewey, 1916, p. 82). So are the views of Stern that "the way [the child] shapes and keeps a kind of plasticity is not only a symptom of the conflict between activity and passivity, it is also a tool for overcoming it." Vygotsky's "zone of proximal development" captures a similar concept. These interwoven ideas owe much to Hegelian idealism and the emergent, developmental assumptions with which it has been associated.

At the level of theory, Dewey created a framework for conceptualizing development and education rather than providing a tightly knit model to guide teaching practices. There are ambiguities, however, in how the transition is made from theory to practice. For example, the idea of a "restructuring of experience" does not provide prescriptive rules on how challenging the task must be, or how much assistance and drill the child should be given.

In a review of Dewey's work and thought, Cahan (1994) emphasized that Dewey considered education to be an opportunity for society to reformulate itself, and that "the school is cast as a lever for social change" (p. 163). This central theme was expressed early by Dewey (1899) in a lecture at the University of Chicago:

> The obvious fact is that our social life has undergone a thorough and radical change. If our education is to have any meaning for life, it must pass through an equally complete transformation. . . . The introduction of active occupations, of nature study, of elementary science, of art, of history; the relegation of the merely symbolic and formal to a secondary position; the change in the moral atmosphere, in the relation of pupils to teachers—of discipline; the introduction of more active, expressive, and self-directing factors—all these are not mere accidents, they are necessities of the larger social evolution. . . . To do this means to make each one of our schools an embryonic community life, active with types of occupations that reflect the life of the larger society, and permeated throughout with the spirit of art, history, and science. When the school introduces and trains each child of society into membership within such a little community, saturating him with the spirit of service, and providing him with instruments of effective self-direction, we shall have the deepest and best guarantee of a larger society which is worthy, lovely, and harmonious. (pp. 43–44)

Hence, educational theory "becomes political theory, and the education is inevitably cast into the struggle for social reform" (Cremin, 1964, p. 118). In Dewey's framework, there is an explicit fusion among the science of human development, educational applications, social reform, and morality. Viewed in historical perspective, Dewey's work and vision may be seen as yet another legacy of his former teacher at Johns Hopkins, Hall.

THEMES OF THE FOUNDATIONAL PERIOD

The emergence of modern developmental psychology in the late nineteenth and early twentieth centuries was hardly a coherent, systematic enterprise. For instance, Dewey's broad philosophical view of development and the embryological concepts of von Baer and evolutionary constructs of Darwin seemed to live in different lands. Considered as a whole, developmental work and theory were diverse, vigorous, contentious, fresh, and, in many instances, brilliant. Despite the lack of unanimity in method and theory, certain themes seemed to capture the attention and guide the work of these early developmental investigators. Seven themes of general significance were:

1. The ontogeny of consciousness and intelligence.
2. Intentionality and the correspondence between thought and action.
3. The relations between evolution and development.
4. The nature-nurture debate.
5. The effects of early experience and when development ceases.
6. Moral development.
7. How the science may contribute to the society.

Knowledge and Consciousness

"Theory of the mind" concepts are hardly new for developmentalists. Indeed, for both comparative and developmental investigators, the origins of consciousness and the development of knowledge were the major empirical concerns in the formative period of the science. The main business of comparative psychology, in the view of Romanes (1884), was to investigate the continuity of consciousness and intelligence from animals to man. To

establish the linkage, it was necessary to undertake studies of animal consciousness and of animals' apparent "intelligent" adaptations to the varied circumstances of life. Why continuity? For Romanes, continuity would demonstrate that human beings were on the same continuum as animals in the evolutionary scheme. Using information brought to him from varied and informal sources, Romanes collected anecdotes on how various beasts (dogs, chickens, spiders, cats) demonstrated high levels of intelligence in their adaptations, and transmitted this knowledge to descendants through Larmarckian mechanisms of hereditary transmission.

Here C. Lloyd Morgan entered the scene. Recall that Morgan's major contribution to developmental and evolutionary thought was his elegant refutation of the concept of hereditary transmission of acquired characteristics, a variation of which Baldwin labeled "organic selection" (Klopfer & Hailman, 1967; Morgan, 1896, 1902). The logic of his argument against Larmarckianism extended beyond psychology and beyond behavior.

Morgan was also instrumental in helping establish some limits on the projection of higher-order cognitive processes to lower organisms. Initially a skeptic about interpreting the mental status of nonhuman animals, he formulated a canon (or criterion) by which such attributions may be permissible. Now known as *Morgan's Canon,* it reads "In no case may we interpret an action as the outcome of the exercise of a higher psychical faculty, if it can be interpreted as the outcome of the exercise of one which stands lower in the psychological scale" (Morgan, 1894/1903, p. 53). In its assumption that the "psychic facility" of nonhuman animals can be qualitatively different from those of human beings, Morgan's criterion helped put a break on the more blatant forms of nineteenth-century anthropomorphism (see also Schneirla, 1966). As a by-product, it invited a shift from a focus on animal consciousness to a focus on animal behavior, including analyses of the roles of biophysical and chemical processes within the organism and physical and social forces without.

The shift was nontrivial. By 1906, H. S. Jennings entitled his magnificent study of the activities of paramecia as "The *Behavior* of Lower Organisms." Earlier, Binet's work on infusoria and other lower beasts was labeled, "The *Psychic Life* of Micro-Organisms" (emphases added). Through Jennings and J. Loeb, the shift in focus paved the way for J. B. Watson's behaviorism (1914) and, ironically, the denial of consciousness. In the article, "How Lloyd Morgan's Canon Backfired," Costall (1993) proposes that "C. L. Morgan argued that the behavior of animals and humans could only be treated in intentionalist terms; his Canon was an attempt to stem anthropocentrism but has been consistently misunderstood" (p. 13; see also Wozniak, 1993). Whatever might have been Morgan's own intentions, he played a pivotal role in extending accounts of behavioral development in animals and children beyond mentalism and anthropomorphism. This was a critical step if developmental research was to be promoted from the second-class status that it had been assigned by Wundt (1907) and Hall (1885).

Questions on the origin of knowledge were also central for early developmentalists. Not only were child psychologists concerned with "the content of children's minds" (Hall, 1891), but with how the content got into the mind. Preyer gave primary attention to the establishment of the senses, language, and cognition, and Binet and Baldwin early focused on experimental studies of childhood perception, discrimination, and memory. J. M. Baldwin's (1895, 1915) developmental theory on the origins of knowledge arose in part from an admixture of the speculations of the post-Kantian and the evolutionary views of Herbert Spencer and G. J. Romanes on stages in consciousness and cognition.

At its root, however, were observations of infants that provided empirical substance to the ideas of reflexive, sensorimotor, and ideomotor adaptations. Baldwin's mature theory of "genetic epistemology" was, essentially, a theory of the mind. It was based for the most part on intuition and the framework that had been established by predecessors in philosophy and biology. It seems no mere coincidence that the dominant concern with cognition and intelligence gave rise to the most robust empirical tests and the most reliable experimental methods of the period.

The Relations between Thoughts and Actions

Although the problem of consciousness was the major theme, questions of the linkages between thoughts and actions lagged not far behind. At what point in ontogeny do "willful" acts arise, and what is the relationship among consciousness and intention and action at any stage of development? These related questions were explored by virtually all early developmental investigators,

but, again, with different emphases and different conclusions. Binet and Freud, in part because of their experience with hypnotism and their exposure to the work of Charcot, were concerned with the role of unconscious processes in the direction and control of behavior, both normal and pathological. Binet's (1892) studies of alterations of personality dealt with the effects of unconscious forces, and Breuer and Freud (1895/1936) made motivation and unconscious control the central theme of psychoanalytic theory. On this score, one of the more interesting observations from this period is the discovery of the linkage between Binet's and Freud's views of unconscious processes. Similarly, Baldwin (1897/1906) considered how conscious acts, with practice and time, become unconscious, and how awareness and intentionality develop in step with cognitive development. Nonetheless, the study of "intentionality" posed formidable methodological problems that were not solved (although Preyer launched an early assault on the problem in his studies of infants).

Ontogeny and Phylogeny

How may development be defined: in terms of the ontogeny of individuals, or the ontogeny of the species? Developmental psychology was born in the wake of the biological revolution created by the formulation and widespread adoption of the Wallace-Darwin theory of species origins. The challenge to produce a similarly powerful theory of individual genesis was felt by biologists and psychologists alike. The initially popular candidates for such a general developmental theory were unfortunately limited.

Doubtless the most influential early developmental theory was the "biogenetic law." Virtually all early important developmental writers were recapitulationists of one sort or another. Adoption of the recapitulation perspective did not, however, preclude consideration of alternative or supplementary views. On this score, the delayed maturation hypothesis of Preyer and the Baldwin-Morgan-Osborne proposal on organic selection represented efforts to solve the puzzle of how development could contribute to evolution as well as the reverse.

The "biogenetic law" collapsed shortly after the turn of the century, when the cornerstone assumption of recapitulation was discredited in biology (Gould, 1977). Embryological studies indicated that morphological steps in development could not be simply accounted for in terms of ancestral analogs. Even in embryogenesis, morphology was adaptive to the special conditions that prevailed and, as von Baer had earlier argued, development was appropriately described in terms of early differentiation of structures in ways that became increasingly distinctive for the species. The idea that evolutionary modifications and developmental adaptations are mutually supportive has been repeatedly offered, from the proposals of Morgan and Baldwin to those of modern ethology and developmental psychobiology. To be sure, the recapitulation doctrine was wrongheaded, but the issues to which it was addressed remain fundamental for the science.

Nature and Nurture

A related but separable matter concerns the extent to which an individual's behavior and propensities reflect the operation of experiences as opposed to an inborn, heritable potential. The "nature-nurture" problem, as labeled by Galton (1871), continues to tantalize developmental theorists. Positions on this matter were as diverse then as they are now. Virtually all writers of this early period paid at least lip service to the proposal that it was not an "either/or" proposition but a question of how the two influences were fused in the course of development.

A variety of methods were employed for the study of "natural" influence on behavior. Preyer, for instance, assumed that the actions that develop in the absence of training must reflect the operation of innate factors in the infancy of an individual child. Galton, in a nomothetic approach, placed emphasis on the information to be obtained from pedigree studies, familial and twin comparisons, and selective breeding in animals. Along with Karl Pearson, he developed new statistical tools for the evaluation of covariation and correlation, and these fit neatly with the metric scale of intelligence. They also invited the partitioning of variance into heritable and environmental sources, a technique that also provided the foundation for modern quantitative behavioral genetics and a century of controversy.

When Does Development End?

All early developmentalists, by definition, assumed that experience played a role in the establishment and maintenance of basic systems of behavior, emotion, and cognition. There were radical differences among them regarding *when* they considered experience to be relevant, since timing made all of the difference in the

world (see Elder, Chapter 16, this *Handbook,* this volume). For Hall, individual experience played a major role in adolescence; early experience was virtually irrelevant because evolutionary forces laid the course for development up through adolescence. For Freud, it was just the opposite: Infancy was key; he assumed very early development to be basic in laying the foundations for adult behavior. Beyond infancy and early childhood, the person resisted enduring changes (except under psychoanalytic treatment). For Preyer, it was embryogenesis. And for Baldwin, personality development was a continuing, never-to-be-exhausted process over the life course, so turning points could occur throughout ontogeny.

When the details of timing and plasticity of development were left unspecified, investigators could talk past each and share a happy illusion that they referred to the same issues and outcomes. A basic premise of psychoanalytic theory is the strong hierarchical assumption that very early experiences are foundational for the thoughts, actions, and relations that follow. Psychoanalytically oriented writers could be radical developmentalists, but only for one phase of the life course. Once the personality structures, motives, and "working models" become established, focus was given to the processes of maintenance, not those of establishment and change. Investigators in a Baldwinian life-course perspective could look to events that occurred over ontogeny.

In the absence of longitudinal information on the behavioral adaptations of human beings, there was no adequate basis for selecting or rejecting these theoretical assumptions about the timing and functions of early experience. Although Mills (1898) called for systematic longitudinal study, it took a half-century before this method was systematically explored, and still another 90 years before it became a method of choice.

Morality and the Perfectibility of Humans

The concern with intentionality and willfulness can be viewed as part of a broader question of ethics: How can science help understand how human perfectibility may be achieved and imperfections avoided? This core issue was clearly pervasive in the moral psychologies of Tetens and Carus, and it was also a matter of no little import for Spencer, Hall, Baldwin, and several others of the era. A goal shared by many of them was to formulate a developmental science, which, in its highest application, would supplement—or supplant—religion.

By 1900, the key empirical finding—that stages existed in the "development of moral judgments"—had been established; in that, older children gave greater weight to the motivation and intentions of a transgressor than did younger children. Similarly, striking age-developmental differences were obtained in the level of abstraction of the "moral judgments," and in the extent to which older children as opposed to younger (12 to 16 years versus 6 to 10 years) took the point of view of the offender. These generalizations were drawn from voluminous questionnaire studies, based on the responses of thousands of children at each age level (e.g., Hall, 1904; Schallenberger, 1894). The methodology, but not the conclusions, was severely criticized at home and abroad. On matters of moral conduct, J. M. Baldwin's proposals adumbrated both Hartshorne and May on the specificity of moral conduct, and the proposals of Kohlberg on the development of the self and moral reasoning.

Social Applications

The application to the needs of society presented both opportunities and problems. To promote the application of "scientific" principles to rearing and educating children, child study movements arose in America, and similar efforts were initiated on the continent and in England. The problem was that scientific principles were in short supply. On this point, William James noted, in *Talks with Teachers* (1900), that "all the useful facts from that discipline could be held in the palm of one hand." Not everyone, including Binet and Hall, agreed with James. Then, as now, the temptation was great to go beyond commonsense beliefs in writing about children.

The ideas and claims of some early developmentalists had political ramifications as well. One of the outcomes was the establishment and rapid growth of the eugenics movement, with Francis Galton as its intellectual leader and the protection of superior genes as its goal in England. One by-product of "Social Darwinism" was the importance attached to the newly devised metric scale of intelligence and the belief that it would permit rapid identification of innate, stable differences in talent. A movement in Germany, promoted by Haeckel (1901), carried a message of biological ethnic superiority and led to dark political goals.

There was also a very bright side to the application of developmental principles and ideas (see Sears, 1975). Persons concerned with the science tended to act as

child advocates, lending their prestige to the passage of child labor laws, the revision of elementary and secondary school curricula, and the promulgation of child-centered rearing and control practices. The discipline may not have directly benefited from these efforts, but the welfare of children did. Then there was the enormous impact that John Dewey's concepts of human development had on teaching and schooling practices. The field moved ahead to consolidate its claim to be an empirical science as well as a progressive social movement.

In summary, the modern study of behavioral development had an auspicious beginning as a vigorous, multidisciplinary undertaking that was pregnant with new ideas, fresh approaches, and novel developmental methods. To the founders, the resolution of the basic problems of development seemed within grasp. Perhaps they were, but that early promise was not to be fulfilled, at least not for another half-century.

THE MIDDLE PERIOD (1913–1946): INSTITUTIONALIZATION AND EXPANSION

One-third of the twentieth century, from 1913 to 1946, encompassed two world wars, an economic depression of unprecedented depth and duration, the rise to world power of two new political-economic systems, and unspeakable horrors of mass destruction and genocide. These events affected the course of all intellectual and scientific work undertaken during the period, and developmental psychology was no exception.

Paradoxically, some of the events that had tragic worldwide consequences served to enrich and broaden the discipline. World War I brought attention to the advantages and potential of psychological assessment, particularly intelligence testing. It also sent the primary U.S. developmental theorist, James Mark Baldwin, to France, where he enjoyed greater influence than he had had in his own country. World War II contributed toward the establishment of psychology as a profession as well as a science. The U.S. prosperity enjoyed in the 1920s was directly translated into liberal support for the discipline by private foundations and state funds. Likewise, the depression of the 1930s and early 1940s effected a massive withdrawal of funds and, concomitantly, a drop in the level of research activity on developmental problems.

Nazi persecution in the 1930s brought to the United States a cadre of brilliant theorists from Europe. Some, including Kurt Lewin, Fritz Heider, and Heinz Werner, gained an opportunity to change the direction of modern social psychology and to keep alive the developmental concept. For others, including Karl Bühler and William Stern, the exodus was a tragedy wherein their talents and achievements were virtually unappreciated and ignored. And what directions might the study of social development have taken if Charlotte Bühler had been permitted to remain safe and free at her Institute in Vienna rather than becoming an adjunct faculty member in Los Angeles?

Beyond societal and political influences, there was much to be accomplished within the area. There was an immediate need to extend the methodological boundaries of the discipline to permit systematic investigation of the several issues claimed by its investigators and theorists. Hence, the formulation of ways to translate ideas into research operations remained a first task. Virtually all substantive issues required attention, from social, cognitive, and sensorimotor analyses to the study of language, moral development, and psychobiological changes. In the 1920s, with the widespread granting of funds that were specifically assigned to support studies of children, there was an explosive increase in empirical research.

In the establishment of its empirical foundations, the enterprise of child and developmental psychology became segregated into separate subareas, topics, and theories. No single model, not even behaviorism, was broad enough to encompass and provide direction for the activities of researchers. The fragmentation stimulated efforts to put the field back together again through the publication of handbooks (which served to summarize the diverse investigations) and the founding of development-centered journals and scientific societies. But in the absence of a compelling and coherent general theory of development, the subareas of developmental investigation and thought evolved along separate trajectories. The story of the main events and ideas of this period is perhaps best told by recounting the progress made in the several areas of inquiry—from mental testing and moral development to language and thought and developmental psychobiology. That is the strategy adopted in this section, beginning with some comments on the institutionalization of U.S. developmental psychology and ending with a brief review of some major theoretical ideas of this period.

INSTITUTIONS AND DEVELOPMENT

The child study movement led by Hall in the 1880s and 1890s bore fruit some 20 years later. Child study associations had been established in one form or another in all regions of the country. Collectively, they formed a potent movement for child advocacy. In 1906, an Iowa housewife and mother, Cora Bussey Hillis, proposed that a research station be established for the study and improvement of child rearing (Sears, 1975). Her argument was simple but compelling: If research could improve corn and hogs, why could it not improve the rearing of children? The campaign to establish a Child Welfare Research Station at the University of Iowa was eventually successful. The Iowa unit was established in 1917 and its research-laboratory school opened in 1921.

The Iowa facility—along with a comparable research unit that opened shortly afterward at the Merrill-Palmer Institute in Detroit—became the model for child development institutes that were to spring up across the United States and Canada in the 1920s and 1930s. Because one of the main functions of the institutes was dissemination of information about children, various publications were established, ranging from university monograph series (at Iowa, Columbia, Minnesota, Toronto, and Berkeley) and journals (*Child Development, Child Development Monographs*) to handbooks (Murchison, 1931, 1933) and magazines (*Child Study, Parents Magazine*). Most of the institutes also awarded advanced degrees, thereby helping to create a new professional workforce. The graduates found placements in university teaching and research positions, as well as in a wide range of applied settings. An interdisciplinary organization, the Society for Research in Child Development, was established in 1930 to provide a forum and a framework for scientific contributors to the discipline (Frank, 1935).

The story of this "golden age" for the study of children in the United States has been told expertly by two of its participants (Sears, 1975; Senn, 1975), so only an overview is required here. New funds from diverse private and governmental sources were made available to researchers in child development. Among the more notable contributors were the individual sponsors of the Fels and Merrill-Palmer child study institutes, along with various special-mission projects (i.e., Terman's study of gifted children, by the Commonwealth Fund; the study of the effects of motion pictures on children, by the Payne Foundation; the causes of morality, by the Institute for Religious and Social Education).

But in terms of sheer impact on the field, the Laura Spelman Rockefeller Memorial (LSRM) must be acknowledged as having the greatest influence. Through LSRM funds, major centers for research were established at three universities (California, Columbia, Minnesota). Substantial support was awarded to the existing institutes at Yale and Iowa, and smaller-scale research centers were created at the University of Michigan and in Washington, DC. Studies of personality and child development at Vassar, Sarah Lawrence, and Teachers College (Columbia) also shared in the Rockefeller support. And that's not all. Under the general direction of Lawrence Frank, the Rockefeller funds provided support for individual research projects (including C. Bühler's pioneering investigations) and made possible the establishment of the national Child Study Association (see *Child Study,* vols. 1 to 3). Such liberal support for child study provided stimulation for ongoing work at Stanford, Harvard, Toronto, and Cornell. All in all, the effect was to confirm Binet's observation that Americans like to do things big.

To summarize in detail the specific activities and accomplishments of these institutes from 1920 to 1940 is beyond the scope of this review. At midstream, Goodenough (1930b) provided an informative coverage of the work and accomplishments during a period of great activity. Each institute soon evolved its own "personality" in terms of methods employed and problems addressed. The issues that the institutes tackled should illustrate the point.

1. *Mental testing.* Virtually all of the institutes were committed, at some level, to clarifying the problems of intelligence assessment and how individual differences in test performance came about. By the late 1930s, studies at Iowa on the effects of enrichment on intelligence test performance had appeared, and longitudinal work on the stability and change of IQ had begun at Fels and Berkeley. Anderson (1939) at Minnesota offered a provocative theory of the continuity of intellectual functions, based on the extent to which early tests assessed functions that overlapped with those assessed in later tests. The faculty at Stanford, headed by Lewis Terman and Quinn McNemar, strongly contested any strong claims on the malleability of intelligence (Minton, 1984).

2. *Longitudinal study.* Most thoughtful developmental psychologists recognized the need for gaining adequate information about behavior and development over a significant portion of the life span. But the lack of resources inhibited such long-term, large-scale investigations of behavior and cognition. Here is where the institutes were invaluable. Two of the institutes—Berkeley and Fels—launched systematic longitudinal investigations. The work complemented the already initiated study by Terman at Stanford.

3. *Behavioral and emotional development.* The study of children's fears and how they arise was undertaken at Columbia, Johns Hopkins, Minnesota, California, and Washington University (St. Louis). This work, essentially an extension of the projects launched by Watson and his collaborators at Johns Hopkins (see below), dealt with the problems of how emotions arise in ontogeny and how fears are learned and unlearned (Jersild, Markey, & Jersild, 1933; M. Jones, 1931).

4. *Growth and physical maturation.* The early work of the Iowa group was concerned with the study of children's physical development, including the care and feeding of children (Baldwin & Stecher, 1924). Similarly, Arnold Gesell's institute at Yale led the way in establishing graphs of normal development for use in identifying instances of aberrant behavior or developmental disorders (see below). The Fels Institute early established a tradition for clarifying the relations between physical and behavioral development, leading to, among other things, significant advances in assessment and diagnosis of psychosomatic relations.

5. *Research methods.* John Anderson and Florence Goodenough at Minnesota, Dorothy S. Thomas at Columbia, and H. McM. Bott at Toronto recognized the need for more adequate observational research methods (see Anderson, 1931; Bott, 1934; Goodenough, 1929; D. S. Thomas, 1929). But the methodological work was not limited to observational techniques. Goodenough (1930a) continued to explore alternative and flexible methods for personality and intellectual assessment (including her Draw-a-Person test), and these workers led the way in ensuring that high levels of statistical sophistication would be employed in research design and analysis. Dorothy McCarthy at Minnesota and Jean Piaget at the J. J. Rousseau Institute began their influential studies of the origins of children's language and thought.

This is a mere sampling of the major concerns and issues. Without detracting from the intellectual and scientific quality of the work completed, it should be noted that few major theorists were associated with the newly founded institutes. There were some notable exceptions to this generalization, including Jean Piaget at the Rousseau Institute and, in the 1940s, Kurt Lewin and Robert Sears at Iowa. For the most part, the institutes were devoted to the pragmatic problem that Mrs. Hollis had identified, "How can we improve the way that children are reared?" The area soon learned that it had neither methods nor theories adequate to the task. The institutes focused on devising more adequate methods, leaving the primary theoretical work to others.

MENTAL TESTING

In the eyes of many developmentalists in the 1920s and 1930s, the major obstacle to establishing a credible science of child psychology was not theoretical so much as it was methodological. Given Binet's insights on and career-long devotion to the matter, it seems altogether fitting that he, along with his collaborators, engineered the most significant methodological advance of the first half-century of the science. Whatever may be the flaws and shortcomings of the Binet-Simon method of intellectual assessment, it provided the tool that was required for the precise study of children's development, and for the translation of cognitive events into quantifiable units. The test opened the door for comparisons of significant psychological dimensions across ontogeny, and for the analysis of individual differences among persons. It also provided a reliable method for addressing the major themes that had been identified in the first era of the field, including the problems of nature-nurture, early experience, continuity of consciousness, and the predictability of behavior and cognition.

Goddard (1911) deserves credit for having been the first to bring the Binet-Simon scale to the United States, but Lewis M. Terman and his colleagues at Stanford University were key in extending the use of intelligence tests in the United States and worldwide through their revision of the Binet-Simon scales. The Stanford-Binet individually administered tests helped establish clinical psychology as a separate profession in clinics, schools, the military, and industry, fulfilling one of Binet's visions (J. Peterson, 1925).

Like other students of Hall who gravitated toward educational psychology, Terman's initial academic appointment at Stanford was in the School of Education.

Formerly a school principal, Terman had a long-standing interest in the problems of individual differences in the classroom. He selected as his dissertation project the comparison of seven bright and seven dull boys on various measures (Terman, 1906). He had been acquainted with Binet's work since his research for his undergraduate thesis at Indiana University, and, given his background and the Barnes-associated tradition at Stanford for large-scale study, it seemed entirely in character that Terman should attempt an extensive standardization of the Binet-Simon scales (on some 1,000 California schoolchildren; Terman, 1916). Among other improvements to the scale, Terman adopted a suggestion by William Stern that any child's performance could be expressed in terms of an Intelligence Quotient (IQ). In his commitment to observation and standardization, Terman proved to be a worthy successor to Binet. The Americanized version of the test was an almost immediate success. The method was widely adopted and the essential idea was used to construct group tests to meet the needs of the military (in screening recruits for World War I) and the schools to sort out highly gifted or retarded children (Goodenough, 1954).

This is not the place to attempt a comprehensive account of the testing movement; useful histories of mental testing, through 1925, can be found in J. Peterson (1925) and K. Young (1924), and more recent accounts can be found in Goodenough (1954), and Carroll and Horn (1981). Three comments on mental testing and its relation to developmental psychology are in order, however.

First, the method paved the way for systematic comparisons across time, across persons, and across conditions. This was a necessary step toward the conduct of longitudinal studies of human behavior. It also provided the tool for comparing persons of different backgrounds, races, and environmental experiences, thereby permitting the researcher to address anew the problems of heredity and environmental influence. The study of the effects of early experience on IQ was explored by Sherman and Key (1932), by Wheeler (1942), and by the Iowa group led by Skeels and Wellman (Skeels, 1966; Skeels, Updegraff, Wellman, & Williams, 1938). In addition, the procedure was applied in ways not anticipated by its innovators. For instance, Kamin (1974) reported the tests were used as a screening device for immigrants to the United States—a practice that was hardly appropriate, given the diverse backgrounds of the persons being tested and the conditions of assessment. The device proved to be an exceedingly powerful tool for categorization and for differentiation of cognitive abilities.

Second, this comment concerns the relation of the testing movement to the rest of psychology, especially the rest of developmental psychology. Interest in the use of the procedure as a research device initially rode a wave of enthusiasm, followed by a period of neglect. When experimental studies of how performance on intelligence tests could be modified were conducted in the 1930s, it became clear that increments of one or more standard deviations (e.g., 10 to 20 IQ points) were not uncommon and could be brought about in a relatively brief period (4 to 16 weeks; see H. E. Jones, 1954, for a review of this work). In addition, Sherman and Key (1932) demonstrated that a negative correlation was obtained between IQ and age among children living in culturally deprived Appalachia. Such findings raised questions about the environmental contributions to IQ scores, and much debate about the nature and meaning of the findings followed (see McNemar, 1940; Minton, 1984). A parallel controversy arose over the interpretation of twin data, and the implications of findings from the tests of monozygotics, dizygotics, and other types of siblings for the inheritance of intelligence. The issues subsided, without clear resolution, in the late 1930s, then came to the forefront again some 30 years later.

Third, the method of intelligence testing did not give rise to a coherent theory of the development of intelligence. The theoretical debates centered mostly around matters of test structure and statistical analysis (e.g., whether a single factor could account for the variance or whether two or multiple factors were required) and whether the results of the experimental tests were being properly interpreted. There was a significant gap between the emerging theories of cognition (following the model of Baldwin and Piaget) and the methods of assessment being employed. Neither Piaget nor Baldwin are mentioned in Goodenough's (1954) comprehensive chapter on "mental growth." The gap was not unprecedented: A parallel problem could be found between the methods of social interactional assessment and the theories of personality and social learning patterns (see below). But the test procedures proved their worth in education and in the marketplace, even though they could not be readily integrated into the existing body of psychological theory. Hence, the testing movement evolved and prospered outside the mainstream of developmental psychology (Dahlstrom, 1985).

LONGITUDINAL STUDIES

According to Wesley Mills (1899), the discipline needed (a) longitudinal studies of individual organisms from birth to maturity, and (b) systematic experimental manipulations of the long-term conditions for development. Without that information, one could scarcely hope to achieve a firm grasp of the processes of development, whether nonhuman or human. Because the major hypotheses about development were concerned at their root with these processes, one would have thought that longitudinal studies would have been given the highest priority in the new discipline. They were not. Perhaps the practical difficulties in mounting life-span projects in humans seemed too formidable, or the investment and risks seemed too great. For whatever reasons, the information available about longitudinal development by the end of the first period of the area's history was either sketchy (e.g., Binet's study of his two daughters) or subjective and retrospective (e.g., psychoanalytic interviews). But, on this fragmentary information, the most influential psychoanalytic and behavioristic theories of cognitive and personality development were formulated, and few data were available to assess their implications or correct their shortcomings.

One of the obstacles for longitudinal study—the need for measurement—seemed to be solved by the development of a reliable device for the metric assessment of cognitive abilities. That advance was sufficient for Lewis M. Terman, who perfected the instrument and pioneered the first large-scale longitudinal study of behavioral-cognitive characteristics in 1921. He selected 952 boys and girls in California, from 2 to 14 years of age, who achieved a test score of 140 IQ or above. This group comprised the brightest children (in terms of test performance) who could be found in a population of about a quarter-million (Terman, 1925). His initial aim seems to have been the planning of educational procedures for gifted children. As it turned out, the sample provided the core group for follow-up studies that continued through most of the twentieth century. At several stages in childhood and early adulthood, these "gifted" children-cum-adults were reassessed, with the behavioral net widened to include personality characteristics, life accomplishments, and social adaptations. Later, their spouses and children were included in the study, and each group of subjects was followed through the 60th year of life (Sears, 1975). Despite shortcomings in the original design (e.g., absence of a matched nongifted control or comparison group), the data provide a rich yield of development through the life span. Overall, the work constitutes one of the major achievements of the science in its first century, incorporating the efforts of three of its most influential figures (Binet, Terman, & Sears).

Another factor that had inhibited longitudinal studies was the need for research institutes that would survive as long as their subjects. That problem was solved in the 1920s by the formation of the several child research institutes across the United States. Soon afterward, longitudinal projects were initiated at Berkeley, Fels Institute, Minnesota, and Harvard. Initially, smaller short-term projects were undertaken to investigate particular issues. Mary Shirley (1931, 1933a, 1933b), for instance, completed a 2-year-long investigation of the motor, emotional, and social development of infants. In contrast to the cross-sectional studies of Gesell, her longitudinal work permitted her to identify particular sequences in growth and change.

Experimental intervention studies of the sort that Mills (1899) had called for in animals were undertaken with children. Myrtle McGraw's (1935) work with Jimmy and Johnny, twins who were given different training experiences, is one of the better instances of the use of what Gesell called the "co-twin" control procedure. By providing "enrichment" experiences prior to the normal onset of basic motor functions, McGraw was able to demonstrate that experiences can facilitate the appearance and consolidation of climbing and other movement patterns. The "enriched" twin continued to show a modest advantage over the control twin, even though age and associated growth greatly diminished the apparent gains (see Bergenn, Dalton, & Lipsitt, 1994, for a more detailed account of McGraw and her contributions). Along with these well-known works, a large number of lesser-known investigations were addressed to the same issues, using short-term longitudinal interventions to influence intelligence test performance (e.g., Hilgard, 1933) and motor skills (e.g., Jersild, 1932).

These studies of longitudinal development were limited to children, at least in the initial stages. What about development beyond childhood? Since the early investigations of Quetelet, there had been few attempts to address directly the problems of developmental change during maturity. The exceptions are noteworthy because they provide part of the foundation for contemporary emphasis on the study of development over the entire life span of human experience. One of the first texts on

aging was produced by Hall (1922), shortly before his death. Later in the same decade, Hollingworth (1927) published a text on development over the whole life span, and some 12 years later, Pressey, Janney, and Kuhlen (1939) extended the coverage.

The database for these extensions to developmental issues over the life span was meager, at best. Surprisingly little research on behavioral development in adolescence was stimulated; perhaps Hall's major work gave the appearance that all of the important questions were already answered. One of the more interesting studies of this age group was reported by Bühler (1931), who analyzed the diaries of some 100 adolescents. In describing this work, Bühler (1931) writes:

> Intimate friendship is by all authors, considered as a characteristic of adolescence, not of childhood. The same is true of that love or devotion which one calls *hero-worship.* This is also considered as a very characteristic feature of puberty. Charlotte Bühler studied, on the basis of adolescents' diaries, the distribution and types of hero-worship during puberty. Her collection of about one hundred authentic diaries contains contributions from different countries, different milieus, and different age groups. . . . There are German, Austrian, American, Czech, Swedish, and Hungarian diaries in this collection. Statistics show that the average age at which girls begin to write diaries is thirteen years and eight months, while the average age for boys is fourteen years and eleven months. In all of the girls' diaries either a "crush" or a flirtation plays a role, sometimes both. The period of the "crush" is from thirteen years and nine months to seventeen years. The boys' diaries show a larger variety of types of friendship. In the place of the "crush," a devoted admiration for a leader or for a girl, or often for an older woman, plays a role. (p. 408)

Diaries provided an innovative substitute for prospective longitudinal data, providing an account of the adolescent's most intimate thoughts, concerns, hopes, and wishes. But it also had certain hazards, with the problems of selection paramount (e.g., who keeps a diary, what is selectively omitted or recorded). Because of its inherently private nature, the method has few safeguards against fraud. On this score, Sigmund Freud wrote a laudatory introduction to the published version of a diary that, upon critical examination, proved to be a fake. It is a modest irony that the young Cyril Burt (1920–1921) exposed the fraud. Some 50 years later, Kamin (1974) and others raised questions about biases and the accuracy of data in Burt's own work on twins reared apart. Despite the pitfalls, diaries continued to provide a potentially rich source of information about the beliefs, attitudes, and conflicts of adolescents.

Given the amount of time, effort, and funding required for these longitudinal studies, what could be said about their payoffs by mid-century? Were they worth the investment? The early returns indicated that the highest levels of predictability were obtained when the assessment procedures had previously established reliability and utility (i.e., intelligence and physiological measures). In social and personality characteristics, however, individual differences appeared to be demonstrably less stable over time. Because the longitudinal work was, for the most part, atheoretical, except for an implicit belief in the long-term stability of human characteristics, the early findings posed serious problems for interpretation. Were the methods and measures at fault, or was the theoretical framework itself to blame? It took research another half-century to answer this question.

BEHAVIORISM AND LEARNING

At about the time that World War I began in Europe, U.S. psychology underwent an internal upheaval. John B. Watson (1878–1957) called behaviorism a "purely American production" (1914, p. ix). Its essential message—that the study of humans, animals, and children required the objective methods of natural science—was of fundamental importance, but it was hardly novel. Others close to Watson, including his mentors in behavioral biology (Jacques Loeb and H. S. Jennings) and his colleagues in psychology (e.g., K. Dunlap), had expressed similar ideas. But none had presented the argument with the persuasiveness and flair that Watson did in person and in print. As Watson (1914) put it:

> Psychology as the behaviorist views it is a purely objective experimental branch of natural science. Its theoretical goal is the prediction and control of behavior. Introspection forms no essential part of its methods, nor is the scientific value of its data dependent upon the readiness with which they lend themselves to interpretation in terms of consciousness. The behaviorist attempts to get a unitary scheme of animal response. He recognizes no dividing line between man and brute. The behavior of man, with all of its refinement and complexity, forms only a part of his total field of investigation. (p. 1)

For Watson, there was an essential unity in animal and human psychology. The methodological differences that trifurcated the discipline for Hall and divided it for Wundt were not valid; the study of children, animals, and adult human beings could be reduced to the same behavioral, noncognitive techniques. Moreover, Watson called for a pragmatic psychology, one that could be applied in society and useful in everyday affairs. Watson liberalized psychology by holding, in effect, that the science could apply itself to any problem of life and behavior.

Watson was originally trained in comparative psychology and heavily influenced by biologist Jacques Loeb, who was "concerned with explaining animal behavior in terms of physiol-chemical influences and without the use of anthropomorphic, psychic, or mentalistic terms" (Jensen, 1962, p. x). His explanatory concept of "tropism" was borrowed from studies of plants, where stimulus-directed movement occurs, say, toward sunlight. At the same time, another behavioral biologist, H. S. Jennings, agreed with Loeb on the need for objective analysis, but he also emphasized the "complexity and variability of behavior in lower organisms and the importance of internal factors as determinants of behavior" (Jensen, 1962, p. x). How Loeb—Watson's mentor at Chicago, and Jennings—Watson's senior colleague at Johns Hopkins—outlined many of the essential ideas of behaviorism is a fascinating story that has been brilliantly documented by D. D. Jensen (1962; see also Pauly, 1981).

Watson's contributions to development evolved through two stages: empirical and theoretical. Consider first his methodological and research contributions to developmental study. Consistent with his vision, Watson set about to demonstrate the relevance of purely behavioral procedures to the study of human behavior. He began his work with newborn infants and the analysis of the conditioning of emotional reactions (Watson & Morgan, 1917; Watson & Rayner, 1920). Watson was well prepared for the task; by mid-career, he had been recognized as one of America's leading researchers in comparative and physiological psychology (Buckley, 1989; Horowitz, 1992).

Why did Watson choose to work with infants? Given the methodological outline of behaviorism, would it not have been as appropriate to begin with adolescents or adults? Watson provided the answer himself in his "lifechart" of human activities, where he asserted that "to understand man," one must begin with the history of human behavior (1926). He saw personality as being shaped by learning experiences from birth onward. Innate reflexes and inherent emotions provided the substrate, and conditioning and learning mechanisms permitted the elaboration of emotions and behavior in development. Personality thus was the outcome of a hierarchical structure, and discrete learning experiences provided the essential building blocks. The conditioning of early emotions—love, fear, or rage—provided the foundation for all that followed. In his stress on emotions and early experience, Watson seems to have been influenced directly by Freud (as Watson suggested in 1936, in his autobiographical statement), as well as by other views of personality current in the day (including McDougall's, 1926, theory of sentiments). In any case, the study of emotional development in infancy became the focus for Watson's experimental and observational work from 1916 to 1920. Because of his work, Watson (along with E. L. Thorndike) was credited in an early *Handbook of Child Psychology* as having initiated experimental child psychology (Anderson, 1931, p. 3). Binet was overlooked again.

The infant work was conducted in the laboratories and newborn nursery at Johns Hopkins Hospital from 1916 through 1920; it was interrupted by Watson's service in World War I and terminated by his being fired from Hopkins in 1920. The series involved controlled observation of stimuli that elicit emotional reactions in infants (Watson & Morgan, 1917), a systematic attempt to catalogue the behavior responses present at birth and shortly afterward (Watson, 1926), and the experimental conditioning and manipulation of fear reactions (Watson & Rayner, 1920).

Although Watson's conditioning studies were only demonstrational and would hardly deserve publication on their methodological merit, they proved to be enormously influential. Following the lead of the more extensive and careful work of Florence Mateer (1918) and of the Russian investigator N. Krasnogorski, who first reported in 1909 the conditioning of salivation in children (see Krasnogorski, 1925; Munn, 1954; Valsiner, 1988), Watson boldly attacked the problem of the conditioning of emotions in infancy in the "case of Albert." What was impressive about this work was the finding that fear was conditioned and, once established, resisted extinction and readily generalized. As M. C. Jones (1931) pointed out, "conditioned emotional responses" differ from earlier demonstrations of reflexive conditioning in that there was one obvious discrepancy: "Whereas the conditioned reflex is extremely unstable, emotional responses are often acquired as the result of one traumatic experience and are pertinacious even in

the absence of reinforcement" (p. 87). According to Watson (1928), "guts can learn", and they seemed to have excellent memories. He wrote, "This proof of the conditioned origin of a fear response puts us on a natural science grounds in our study of emotional behavior. It yields an explanatory principle which will account for the enormous complexity in the emotional behavior of adults" (p. 202). Conditioned emotional responses, whether in the form of the "CER" of B. F. Skinner and W. K. Estes (1944), the "two-factor theory of anxiety" of Solomon and Wynne (1953), or the "learned helplessness" concept of Maier, Seligman, and Solomon (1969), have continued to play a significant if enigmatic role in neobehavioral accounts of personality and development.

Although Watson himself completed no further scientific investigations, his experimental studies with infants were taken up by students and colleagues through the 1920s and early 1930s (see M. C. Jones, 1931). Mary Cover Jones (1924) explored the problem of the extinction of emotional reactions, demonstrating how experimentally produced fears could be "undone." H. E. Jones (1930) clarified the short-term stability of the response (not great after 2 months). Later, experimental psychologists investigated the possibility of neonatal (e.g., Marquis, 1931; Wickens & Wickens, 1940) and fetal (Spelt, 1938) conditioning, along with extensive studies of early motor learning. Watson's work also stimulated the development of observational methods to assess children's behaviors, on the one hand, and the establishment of the family of behavioristic theories of learning, on the other (e.g., Guthrie, 1935; Hull, 1943; Skinner, 1938; Tolman, 1932).

This brings us to Watson's theory of psychological development, which grew both more extreme and more expansive the further he became removed from data in time and space. As Watson's ideas on child development became elaborated, it seemed clear that he considered all emotions—not merely fear and rage—to be obstacles for adaptive behavior and a happy life. Among other things, he campaigned, in his influential best-seller, *Psychological Care of Infant and Child* (1928), against too much mother love. The child, he said, would become "honeycombed" with affection and, eventually, would be a social "invalid" wholly dependent on the attention and responses of others. Love, like fear, can make one sick to the stomach.

Despite such rhetoric, Watson's books carried a deadly serious message for the 1920s and 1930s. Science could lead to improved and efficient ways to rear children, and if mothers and children could be liberated from each other early in the child's life, the potential of both would be enhanced. This "modern" view of child rearing was predictably controversial, attracting both converts and devastating criticism. Along with his emotionally cool view of personality, Watson became increasingly extreme in his environmentalism. Although he was developmental in his approach, Watson downplayed the role of psychobiological factors in personality after birth, considering learning to be the key mechanism for the pacing and stabilizing of behavior development from birth to maturity. Biology was important, of course, but only as it established potential for learning. In the absence of evidence on the long-term effects of early experience or longitudinal studies of human development, Watson was skating on extremely thin ice. To his credit, he said so (1926, p. 10). But Watson was in no position to obtain corrective or confirming data; except for occasional part-time teaching at the New School, in New York, and a lecture series at Clark University, he had dropped out of academia and out of scientific research in 1920.

Watson nonetheless became a symbol for a scientific approach to child rearing during the 1920s and 1930s through his popular magazine articles (e.g., in *Harper's* and *Atlantic Monthly*). His views extended into education, pediatrics, psychiatry, and child study, where the stress on the acquisition of habits and avoidance of emotions became translated into prescriptions for behavioristic child rearing. A cursory review of these materials reveals virtually no empirical citations, except for references to the demonstrational studies that Watson conducted or loosely supervised. It should be noted, however, that Watson's advice for mothers to adopt a psychologically antiseptic approach toward their children had not been original with him. In physician Emmet Holt's *The Care and Feeding of Children,* a best-seller since its first edition in 1894, the same guidance had been given on the evils of kissing children ("Tuberculosis, diphtheria, syphilis, and many other grave diseases may be communicated in this way"; Holt, 1894/1916, p. 174) or playing with babies ("They are made nervous and irritable"; Holt, 1984/1916, p. 171). Watson didn't offer fresh guidance so much as new reasons. In the book promotion in 1928, Watson was described as "America's greatest child psychologist" (Buckley, 1989, fig. 15).

What might have happened if Watson had remained involved in empirical research? We can only guess that his statements would have been more closely tied to facts rather than speculations, and that his views about

child rearing would have become less idiosyncratic and less extreme (see Buckley, 1989). But, as we have indicated elsewhere, certain problems remained at the heart of his system (Cairns & Ornstein, 1979). Beyond the behavioristic model of an emotionless and mindless child, perhaps the most salient weakness in Watson's view was the assumption that development was a mechanistic process that could be reduced to fundamental units of learning. Seemingly all behavior was learned, from birth onward, and the earliest experiences were the most basic. This was a peculiar and unnecessary position for a behaviorist to take. Although Watson early claimed psychology was "a definite part of biology," his view of development was nonbiological and nonorganismic. Learning is an essential process in development, but it is not the only process.

Experimental studies of learning in children did not begin and end with Watson. Another influential line of research followed the lead of E. L. Thorndike in studies of verbal learning and in the analysis of the "law of effect" and different reward and punishment contingencies (see J. Peterson, 1931, for a review of relevant studies). The work followed not only the laboratory analogues used by Thorndike (following Binet & Henri, 1895, and Ebbinghaus, 1897), but also within-classroom manipulations of the efficacy of different kinds of reward-punishment feedback (e.g., Hurlock, 1924). The studies of learning and memory were, for the most part, divorced from conditioning research in infants and animals, studies of mental testing, and investigations of language and thought. Areas of inquiry that might be seen as potentially fitting together to form a developmental view of cognition instead evolved separately, each toward its own distinctive methodology, concepts, and discipline affiliation. It would be another 50 years before serious attempts were made to bring them back together (see Carroll & Horn, 1981; Ornstein, 1978).

MATURATION AND GROWTH

While Watson served as the spokesman for behaviorism and environmentalism in child development, Arnold Gesell (1880–1961) was gaining stature as an advocate of the role of growth and maturation in behavior. Trained at Clark University in the early 1900s, Gesell absorbed Hall's vision of the significance of child study, the importance of biological controls in behavior, and the practical implications of child research, particularly for education. After earning his PhD degree, Gesell worked initially in schools and curriculum (as did most of the Clark graduates in developmental psychology in that period). He returned to complete an MD degree at Yale, then founded a child study laboratory in 1911, which permitted him to extend the tradition of W. Preyer and M. Shinn. Gesell (1931, 1933) early demonstrated himself to be an innovative and careful methodologist. He was one of the first to make extensive use of motion pictures in behavioral analysis and to explore the advantages of using twins as controls in experimental studies (i.e., one twin is subjected to the experimental manipulation, the other serves as a maturational control).

In 1928, Gesell published *Infancy and Human Growth,* a remarkable report on several years of study of the characteristics of infancy. According to Gesell, one of his aims was to provide "objective expression to the course, the pattern, and the rate of mental growth in normal and exceptional children" (p. viii). The other aim was theoretical, and the last section of the book takes on "the broad problem of heredity in relation to early mental growth and personality formation . . . and the significance of human infancy" (p. ix).

Gesell (1928) was characteristically thorough in dealing with both problems, and his normative tables and descriptions of how *Baby Two* (2 months old) differs from *Baby Three* and *Baby Nine* ring true to the contemporary reader. On basic characteristics of physical, motor, and perceptual development, children showed reasonably constant growth and age-differentiation. If the infants selected did not, as in a couple of instances, they may be substituted for by more "representative" ones. All in all, the business of establishing appropriate norms was seen as an essential part of his medical practice and the practical issues of diagnosis. As Gesell later described it:

> [The clinical practice] has always been conducted in close correlation with a systematic study of normal child development. One interest has reinforced the other. Observations of normal behavior threw light on maldevelopment; and the deviations of development in turn helped to expose what lay beneath a deceptive layer of "obviousness" in normal infancy. (Gesell & Amatruda, 1941, p. v)

Gesell and his associates established definitive norms for growth and behavioral change in the first 5 years of life, in a series of exhaustive and detailed reports (e.g., Gesell & Amatruda, 1941; Gesell & Thompson, 1934, 1938).

Few psychologists nowadays regard Gesell as a theorist. That is a pity, for his contributions might have provided a useful stabilizing influence during a period that became only nominally committed to "developmental" study. "Growth" was a key concept for Gesell. But what did he mean by growth? Horticultural terms have long been popular in describing children (a classic example being Froebel's coining of "kindergarten"). But Gesell was too astute to become trapped in a botanical analogue; he recognized human behavioral and mental growth as having distinctive properties of its own. He wrote:

> Mental growth is a constant process of transformation, of reconstruction. The past is not retained with the same completeness as in the tree. The past is sloughed as well as projected, it is displaced and even transmuted to a degree which the anatomy of the tree does not suggest. There are stages, and phases, and a perpetuating knitting together of what happens and happened. Mental growth is a process of constant incorporation, revision, reorganization, and progressive hierarchical inhibition. The reorganization is so pervading that the past almost loses its identity. (1928, p. 22)

What does this lead to? For Gesell, it led to a new perspective on the relations between heredity and environment. Similar to what Preyer had written some 50 years before, Gesell (1928) concluded:

> The supreme genetic law appears to be this: All present growth hinges on past growth. Growth is not a simple function neatly determined by X units of inheritance plus Y units of environment, but is a historical complex which reflects at every stage the past which it incorporates. In other words we are led astray by an artificial dualism of heredity and environment, if it blinds us to the fact that growth is a continuous self conditioning process, rather than a drama controlled, *ex machina,* by two forces. (p. 357)

These are not the only similarities to the interpretations offered by earlier students of infant development. Recall Preyer's analysis of infancy, and the functions of the extended immaturity of children for the plasticity of behavior. The concept of neoteny was elegantly restated by Gesell, along with a fresh idea on the social responsiveness that is unique to humans:

> The preeminence of human infancy lies in the prolongation and deepening of plasticity. There is specific maturation of behavior patterns as in subhuman creatures; but this proceeds less rigidly and the total behavior complex is suspended in a state of greater formativeness. This increased modifiability is extremely sensitive to the social milieu and is constantly transforming the context of adaptive behavior. In the impersonal aspects of adaptive behavior of the nonlanguage type (general practical intelligence) there is a high degree of early correspondence between man and other primates. This correspondence may prove to be so consistent in some of its elements as to suggest evolutionary and even recapitulatory explanations. But transcending, pervading, and dynamically altering that strand of similarity is a generalized conditionability and a responsiveness to other personalities, to which man is special heir. This preeminent sociality exists even through the prelanguage period, long before the child has framed a single word. Herein lies his humanity. (1928, p. 354)

As a rule, Gesell stood close to his data. When he ventured away, he was drawn irresistibly back to the facts that had been meticulously collected and to his belief in the curative effects of maturation. He felt strongly that the understanding of the properties of growth qua growth would be the key to unlocking the central dilemmas of psychology. The same year that Watson offered his polemic on the role of early stimulation in child rearing, Gesell offered the counterposition on the invulnerability of the infant to experience. He wrote:

> All things considered, the inevitableness and surety of maturation are the most impressive characteristics of early development. It is the hereditary ballast which conserves and stabilizes the growth of each individual infant. It is indigenous in its impulsion; but we may well be grateful for this degree of determinism. If it did not exist the infant would be a victim of a flaccid malleability which is sometimes romantically ascribed to him. His mind, his spirit, his personality would fall a ready prey to disease, to starvation, to malnutrition, and worst of all to misguided management. As it is, the inborn tendency toward optimum development is so inveterate that he benefits liberally from what is good in our practice, and suffers less than he logically should from our unenlightenment. Only if we give respect to this inner core of inheritance can we respect the important individual differences which distinguish infants as well as men. (1928, p. 378)

The infant is more robust than he appears, in that he is buffered by psychobiological fail-safe systems and driven by an "inborn tendency toward optimum development." The message is a general one, issued by one who observed the remarkable commonalities in infant growth

as it progresses, inevitably, from the stage of the neonate to the 1st year and beyond.

Does this inborn inertia apply to all features of infant growth—to mental development as well as personality and social development? On this matter, Gesell drew a distinction between the mechanisms that control cognitive and social growth. In the latter instance—social growth—the essential determinants were the social matrix present in the "web of life" and the "conditioned system of adaptation to the whole human family." Sound Watsonian? Not really, for Gesell is closer to the transactional views of James Mark Baldwin than to the unidirectional ones of behaviorism and its emphasis on the parental shaping of children. Gesell (1928) wrote:

> All children are thus, through correlation, adapted to their parents and to each other. Even the maladjustments between parent and child are adaptations in a psychobiological sense and can only be comprehended if we view them as lawfully conditioned modes of adaptation. Growth is again the key concept. For better or for worse, children and their elders must grow up with each other, which means in interrelation one to the other. The roots of the growth of the infant's personality reach into other human beings. (p. 375)

In effect, maturational changes demand interactional ones, and the nature of the resolution reached between the child and others at each stage is the stuff out of which personality is built. Gesell offers here the outline for a psychobiological theory of social development.

Where did the theory go? Not very far in Gesell's work, for it remained in a bare outline form, with scant data to back it up. Like Baldwin before him, Gesell did not have the methods (or perhaps the desire) to continue to explore the dynamic message implicit in this psychobiological view of social interactions. That is doubly unfortunate, for his views on social development were at least as reasonable and no more speculative than those of Watson. If enunciated more fully, they may have provided explicit guides for his next-door colleagues in the Institute of Human Relations when they set about to fabricate the first version of social learning theory. Some 40 years later, the essential model was explicated by Bell (1968) and Bell and Harper (1977), using surprisingly similar models and metaphors.

In speaking of Gesell's legacy, Thelen and Adolph (1992) comment on some of the paradoxes in Gesell's work:

> His devotion to maturation as the final cause was unwavering, yet he acted as though the environment mattered, and his work contains threads of real process. He believed in the individuality of the child but chose the dictates of the genes over the whims of the environment. He wanted to liberate and reassure parents but may only have added to the arsenal of parental guilt. (p. 379)

In retrospect, Gesell's views may seem paradoxical only because we fail to respect the distinctions that he made. A key distinction is that social interactions of children are more likely than motor and sensory structures to be impacted by experience; hence, there is a "generalized conditionability and a responsiveness to other personalities, to which man is special heir." Gesell did not assume the primacy of early experience; rather, the infant is buffered because "the inborn tendency toward optimum development is so inveterate that he benefits liberally from what is good in our practice, and suffers less than he logically should from our unenlightenment." This is a powerful message, consistent with the earlier pronouncement from Hall on adolescence. At the least, it indicates that investigators should look beyond infancy for the formative effects of experience, particularly the effects in "responsiveness to other personalities."

Gesell was a pioneering investigator who understood the totality of the organism. He also understood that experiential factors must be considered in any systematic developmental account. Although he appreciated the multiple ways that environmental events could influence behavior, he declined to assign them priority in accounting for the development of basic motor, sensory, and emotional systems.

Other investigators recognized the role of age-related biological changes in the development of behavior, and their relations to the occurrence of basic changes in emotional, cognitive, and social patterns. For example, M. C. Jones (1931), in discussing the development of emotions, remarks that a wariness or fear of unfamiliar persons tends to emerge in the second half of the 1st year of life (from 20 weeks to 40 weeks; see Bayley, 1932; Washburn, 1929). Jones notes that this phenomenon appears in the absence of any apparent pairing of the stranger with some external noxious stimulus; hence, it would not fit very well with the Watsonian view of the conditioned elaboration of fear or of love. Other developmental mechanisms must be at work.

Why the relative popularity of experimental demonstrations of fear and its conditioning and extinction, as opposed to careful longitudinal studies of the development of the phenomena subsumed by fear? M. C. Jones's (1931) answer was insightful and doubtless cor-

rect: "Because training and practice are more readily subject to laboratory proof, we have at times minimized the importance of the less accessible intraorganismic factors" (p. 78).

The availability of funding and staffing for the major child development institutes permitted the support of significant studies of maturation and growth at Teachers College (Columbia), Berkeley, Iowa, Minnesota, and Fels Institute. Among the more notable studies was that of Mary Shirley at the University of Minnesota. To extend Gesell's cross-sectional observations, Shirley conducted a longitudinal investigation of motor, emotional, and personality development over the first 2 years of life with 25 infants, and published the results in a comprehensive three-volume work (Shirley, 1931, 1933a, 1933b). Similarly, the Shermans at Washington University (St. Louis), McGraw (1935) at Teachers College, and K. M. B. Bridges at Montreal completed useful studies of growth-related changes in infants and young children.

SOCIAL AND PERSONALITY DEVELOPMENT

In a review of studies of social behavior in children, Charlotte Bühler (1931) gave an American, Will S. Monroe, credit for having completed the first studies of "the social consciousness of children." Monroe's work, published in German (1899), reported a number of questionnaire studies dealing with various aspects of social development. For instance, children were asked what sort of "chum" they preferred, what kinds of moral qualities they found in friends, and what their attitudes were about punishment, responsibility, and discipline. Monroe's work was not, however, the first published set of studies on these matters. Earl Barnes of Stanford (who had been Monroe's teacher) had earlier edited a two-volume work (*Studies in Education;* 1896–1897, 1902–1903) that had covered the same ground, reporting a reasonably comprehensive set of questionnaire studies of social disposition. Margaret Schallenberger (1894), for instance, had been at Stanford and was a student of Barnes at the time she completed the report discussed earlier on age-related changes in the social judgments of children. In the 1890s, questionnaires were being circulated to teachers throughout the country, through the various state child study associations (in Illinois, South Carolina, Massachusetts), and literally thousands of children were being asked brief questions about their social attitudes, morals, and friendships. Hall from time to time would include questionnaires in the *Pedagogical Seminary,* and would ask readers to submit the results to him.

Because of the shortcomings in the method, ranging from haphazard sampling procedures to problems in nonstandard administration and scoring of questions, the questionnaire studies were hardly models of scientific research. Nonetheless, certain age-related phenomena were sufficiently robust to appear despite the methodological slippage; hence, the earlier cited conclusion by Schallenberger about the reliance of young children on concrete forms of punishment, with reasoning and empathy playing roles of increasing importance in early adolescence. These findings were given wide circulation in Hall's *Adolescence,* and provided the empirical substrate for some of the more useful sections of that work. In time, the criticisms took effect, and after about 10 to 15 years of questionnaire studies, the method was no longer a procedure of choice. As Bühler notes, "little was done in the decade after Monroe made this first start in the direction of developmental social psychology," and, she concludes, the studies failed because of "the lack of a systematic point of view" (1931, p. 392).

Following a hiatus in work on social development, another method was introduced for studying the social behavior of infants and children in the mid-1920s. It was essentially an extension of the "objective" or "behavioral" procedures that had been used in the investigation of individual infants and young animals. Almost simultaneously, reports of behavioral studies appeared in child study institutes in Vienna, New York (Columbia), Minnesota, and Toronto. Somewhat earlier, Jean Piaget had recorded the naturalistic verbal exchanges among young children (Piaget, 1923/1926). Five of the first eight *Child Development Monographs* from Teachers College (Columbia) were concerned with the methods and outcomes obtained by the behavioral assessments of social patterns (Arrington, 1932; M. Barker, 1930; Beaver, 1930; Loomis, 1931; D. S. Thomas, 1929). Dorothy S. Thomas, who co-authored with sociologist W. I. Thomas *The Child in America* (1928), seems to have spearheaded this attempt to apply "the methodological scheme of *experimental sociology* to children." In addition to the work of Thomas and her colleagues, insightful methodological papers on the procedure were published by Goodenough (1929, 1930a) at Minnesota and Bott (1934) at Toronto. Charlotte Bühler should herself be credited with having pioneered the controlled experimental observations of infants, and she seems to have been the first investigator to have completed an

"experimental study of children's social attitudes in the first and second year of life" (Bühler, 1931).

Observational studies from 1927 to 1937 generated almost as much enthusiasm as earlier questionnaire studies. They were based on the assumption that the stream of behavior could be classified into particular behavior units, and that these units could be submitted to the statistical analyses previously developed for the treatment of experimental and test data. Careful attention was given to the basic issues of observation, including observer agreement, code reliability, stability of measures, various facets of validity and generality, and statistical evaluation. The issues attacked by the method ranged from the mere descriptive and demographic—including size and sex composition of groups as a function of age (Parten, 1933) and nature of play activities (Challman, 1932)—to studies of the natural occurrence of aggression (e.g., Goodenough, 1931) and reciprocal patterns of interchange (Bott, 1934). By 1931, Bühler was able to cite some 173 articles, many of which dealt directly with the observation of children's social behavior patterns. In the following 5 to 10 years, an equal number of studies was reported, some of which are now recognized as having laid the foundation for work taken up again in the 1970s (e.g., Murphy, 1937). In terms of method, the reports were on a par with the current generation of observational analyses of social interchanges.

What theoretical ideas were associated with these behavioral methods and to what extent was there a "systematic" point of view? There was, as it turns out, as little theoretical guidance for this work as for the earlier questionnaire studies. The work was behavioral, but it was not concerned with developmental processes, either learning or psychobiological. J. M. Baldwin had virtually been forgotten (save for some exceptions, e.g., Piaget, 1923/1926). Given D. S. Thomas's (1929) aims and background, it is mildly surprising that the procedures at Columbia were not more intimately linked to the sociological models of Cooley, Mead, and Baldwin. Perhaps that conceptual extension was part of the general scheme, but it failed to materialize in the work completed at Teachers College or at the other child institutes. As it turned out, the research focused on the immediate determinants of the actions and interactions of children, but scant information was gained about their relationship as to how interactions are learned or modified, or what they mean for longer term personality development.

If there were any theoretical underpinnings for the research on interactions and social development, the model seems to have been drawn either from a belief in the importance of growth and maturation, or from a commitment to the enduring nature of personality types, as determined by genetic, constitutional, or early experience factors. In this regard, Bühler (1931) classified infants into three types, depending on their reactions to social stimulation. "These types were called the socially blind, the socially dependent, and the socially independent behavior" (1931, p. 411). Socially blind children don't pay much attention to the actions and reactions of other persons; instead, they take toys, play, and move about without regard for the other child. The socially dependent child, on the other hand, is "deeply impressed by other's presence and activities; . . . he observes the effect of his behavior on the other and carefully watches the other's reactions." The socially independent child "is one who—though aware of the other's presence and responsive to his behavior—yet does not seem dependent on him, is neither intimidated nor inspired" (1931, p. 411). Bühler sees these dispositions as being independent of home and rearing conditions; hence, they are "primary" dispositions. Retests of the children (who were 6 to 18 months of age) suggested to Bühler that these types were relatively stable, but she adds the caveat that, "it remains to be seen, of course, whether these pioneer observations will be confirmed by other authors" (1931, p. 411).

In retrospect, the interactional studies were estranged from the issues being debated by the dominant theories of the day—psychoanalytic, learning, cognitive—and few seemed willing to attempt to bridge the theoretical or empirical gaps. As it turned out, the data did find a useful service in the practical areas of nursery school management and the training of young teachers. Because the findings were either ignored or deemed irrelevant by those concerned with major psychological theories of development, the method and its concerns passed from the scene, temporarily.

MORAL DEVELOPMENT

The perfectibility of humans and the establishment of a higher moral order had been a continuing concern for developmentalists. Although questionnaires on children's beliefs and attitudes toward transgressions and punishments were useful, they had obvious shortcomings as scientific instruments. In the 1920s and 1930s, work on these issues continued, but with a self-conscious appreciation of the limits of the techniques that were available. Nonetheless, there were substantive

issues to be addressed and real-life problems to be solved, and it seemed entirely reasonable to expect that the investigators of moral development would be ingenious enough to meet the challenge (see V. Jones, 1933). Out of this need arose three major advances in the study of moral development: (1) the use of short-term experimental manipulations in the assessment of honesty and prosocial behaviors; (2) the employment of observations of naturally occurring rule-making and moral judgments; and (3) the refinement of attitudinal questionnaires that might be employed in the assessment of particular experiences.

The demonstration of the utility of short-term experimental procedures with school-age children has an unusual background, at least in comparing what the sponsors had hoped to learn and what they actually got. Hugh Hartshorne was a professor in the School of Religion at the University of Southern California, and Mark May was a psychologist at Syracuse University when they were recruited to Columbia University by the Institute of Social and Religious Research to conduct a multiyear project on how Sunday schools, churches, and religious youth groups could better do their job. E. L. Thorndike was a guiding force in the initiation and interpretation of this research. If physical science could solve problems for the society, why could not behavioral science help solve some of the moral and ethical issues that had arisen?

The project was an ambitious one: to analyze the effects of various institutions of the society on moral behaviors, and to determine how the institutions could improve their performance. At the outset, Hartshorne and May recognized that they must solve the problem of the assessment of moral and ethical behaviors. Following a critique of then-available questionnaire and rating procedures, Hartshorne and May concluded that a fresh approach to the study of values and character was required. They wrote: "Although recognizing the importance of attitude and motive for both social welfare and individual character, as ordinarily understood, we realized that in any objective approach to ethical conduct we must begin with the *facts of conduct*" (1929, vol. 3, pp. 361–362). Accordingly, the investigators developed a battery of tests and experimental settings designed to yield information about honesty, helpfulness and cooperation, inhibition, and persistence. The best known measures are the brief experimental assessments of deceit (permitting the misuse of answer sheets, peeping, and other forms of cheating, all of which were monitored in sly ways by the experimenter). They also devised various sociometric techniques, including a "Guess Who" procedure to assess peer reputation. The results of this work and the authors' interpretation on the relative specificity of moral conduct have been widely discussed. For our purposes, it is sufficient to note that this was one of the first studies to be conducted of short-term experimental manipulations of social behavior in school-age children. In addition, the authors offered a courageous theoretical statement on how ethical conduct is acquired (via Thorndikian learning principles). It was not exactly what the sponsoring agency had expected, or wanted. The Executive Secretary of the sponsoring Institute of Social and Religious Research wrote apologetically in the foreword:

> To lay minds this volume, at first glance, may seem overloaded with matter that has little to do with moral and religious education—a medley of tests and statistics and a paucity of clear directions as to building character. Such readers might profitably reflect that these preliminary processes are inevitable if character education is ever to emerge from guesswork into a science. Medical and surgical science had to follow a similar road to advance from magic and quackery. (Hartshorne & May, 1929, vol. 2, p. v)

Hartshorne and May had concluded that traditional religious and moral instruction have little, if any, relationship to the results of experimental tests of honesty and service to others.

With questionnaire procedures generally in disfavor by the 1920s, the essential problem of how to quantify attitudes remained. L. L. Thurstone, a pioneering quantitative psychologist at the University of Chicago, was recruited by the Payne Foundation to determine the effects that moviegoing had on the social attitudes and prejudices of children. The assignment provided Thurstone the opportunity to develop a new technology for the assessment of moral/ethnic attitudes. In a series of studies, Thurstone and his colleague, R. C. Peterson (Peterson & Thurstone, 1933), introduced new methodologies for gauging the effects of specific motion pictures on attitudes toward national/ethnic groups. They used a pre- and posttest design, coupled with a 5-month follow-up test (post-posttest). Although these studies seem to be little known to contemporary writers, Thurstone himself (1952) considered them to be highly influential for his development of an attitude assessment methodology. Moreover, the work provided a wholly convincing demonstration of the strong effects that certain films had in decreasing, or increasing, racial and religious prejudice. In some cases (such as the inflammatory *Birth of a Nation*),

the unfavorable racial attitudes induced by viewing the film were detected 5 months later. This study was an admirable forerunner to the research of the 1960s and 1970s concerned with the effects of television (see also, V. Jones, 1933).

A major advance was pioneered by Jean Piaget in his assessments of moral reasoning (Piaget, 1932/1973). Piaget's clinical method—observing the actions of individual children and carefully recording their responses—permitted him to identify changes in the children's employment of rules and their origins. Although the procedure shared the self-report properties of questionnaires, his observations and direct inquiries permitted a more precise identification of the standards being invoked idiosyncratically by the children. Again, the impact of Piaget's reports seems to reflect in large measure the theoretical significance of his interpretations.

THE DEVELOPMENT OF LANGUAGE AND COGNITION

From 1924 onward, the problem of how language and thought develop attracted the attention of the brightest talents of the discipline. Some of them—including Jean Piaget and L. S. Vygotsky—were concerned with language as a vehicle for understanding how thought patterns develop in the child. Others focused on language as a phenomenon in itself, with attention given to the "amazingly rapid acquisition of an extremely complex system of symbolic habits by young children" (McCarthy, 1954).

The comprehensive review articles by Dorothy McCarthy that span this period provide an excellent overview of the era (McCarthy, 1931, 1933, 1946, 1954). At one time or another, virtually all major developmental investigators have been drawn to the study of language development, and so were some nondevelopmentalists as well. The intimate relationship that exists between language and thought was brought brilliantly to the attention of psychologists by Jean Piaget in a small book that he published to report the results of his new functional approach to the study of language development. Piaget's study of language breathed fresh life into one of the oldest questions of the area: How do thought, logic, and consciousness develop? Language was a mirror to the mind, for Piaget; it was to be used to reflect the nature and structure of the mental schemas that gave rise to verbal expressions. In this work, Piaget seems to have been explicitly guided by J. M. Baldwin's view that the young child proceeds in his thought to progressively discriminate himself from nonself. The major empirical marker for this shift in thinking was movement from egocentric speech to socialized speech. Piaget wrote:

> "Egocentric" functions are the more immature functions, and tend to dominate the verbal productions of children 3–7 years of age, and, to a lesser extent, children 7–12 years. In this form of speech, a child does not bother to know to whom he is speaking nor whether he is being listened to. He talks either for himself or for the pleasure of associating anyone who happens to be there with the activity of the moment. This talk is ego-centric, partly because the child speaks only about himself, but chiefly because he does not attempt to place himself at the point of view of his hearer. Anyone who happens to be there will serve as an audience. (1923/1926, p. 9)

Socialized speech, where the child "really exchanges his thoughts with others, either by telling his hearer something that will interest him and influence his actions, or by an actual interchange of ideas by argument or even by collaboration in pursuit of a common aim" (p. 9–10), does not emerge until about age 7 or 8, and the process is not complete until 11 or 12 years of age. Later in the same volume, Piaget linked egocentricism to the child's tendency to personalize thought:

> [Without the ability to "objectify" one's thinking,] the mind tends to project intentions into everything, or connect every thing together by means of relations not based on observation . . . the more the ego is made the center of interests, the less will the mind be able to depersonalize its thought, and to get rid of the idea that in all things are intentions either favourable or hostile (animism, artificialism, etc.). . . . Ego-centrism is therefore obedient to the self's good pleasure and not to the dictates of impersonal logic. It is also an indirect obstacle, because only the habits of discussion and social life will lead to the logical point of view, and ego-centrism is precisely what renders these habits impossible. (1952, pp. 237–238)

In other words, Piaget shares with both Baldwin and Freud the assumption that the child's concept of reality and logic develops from contact with the external world, emerging from an amorphous sense of the self. It is not insignificant that, in the foreword to *The Language and Thought of the Child* (1923/1926), Piaget stated:

> I have also been deeply impressed by the social psychology of M. C. Blondel and Professor J. M. Baldwin. It will likewise be apparent how much I owe to psychoanalysis, which

> in my opinion has revolutionized the psychology of primitive thought. (pp. xx–xxi)

The method employed by Piaget and the concepts he embraced stimulated almost immediate worldwide attention and controversy. In McCarthy's thorough reviews of the empirical data that bore on this question (including her own), she (1931, 1933, 1946, 1954) traced the evolution of a huge literature on the matter. Strict interpretation of Piaget's categories suggested that, over a wide variety of populations and settings in which young children were observed, seldom did the proportion of egocentric remarks exceed 6% to 8%. Moreover, the negative evidence came not merely from studies of children in the United States; an equally convincing set of disconfirming investigations emerged from studies of Chinese (H. H. Kuo, 1937), Russians (Vygotsky & Luria, 1929), and Germans (Bühler, 1931). After identifying what was meant by the concept of egocentric as opposed to socialized speech, C. Bühler (1931) wrote:

> It is agreed, however, among other authors, for example, William Stern and David and Rosa Katz—that this result is due to the special conditions of life in the "Maison des Petits" in Geneva, where Piaget's work was done. The Katzes (1927) emphasize, in opposition to Piaget, that even the special relationship of the child to each of the different members of the household is distinctly reflected in the respective conversations. This is surely true of all the dialogues they published. (p. 400)

This was a key point for Bühler, who had just spent several years of her life demonstrating the quality and nature of the social patterns of children in infancy and early childhood. She had conclusively shown the truly "social" nature of their behaviors. Note that Bühler attributes the discrepant findings to the contextual-relational specificity of Piaget's initial observations. Piaget seemed to accept that explanation, at least for the time being. In the foreword to the second edition of *The Language and Thought of the Child* (1923/1926), he wrote:

> [Our] original enquiries dealt only with the language of children among themselves as observed in the very special scholastic conditions of Maison des Petits de L'Institut Rousseau. Now, Mlle. M. Muchow, M. D. Katz, Messrs. Galli and Maso, and M. A. Lora [Luria], after studying from the same point of view children with different scholastic environments in Germany, Spain, and Russia, and especially after studying children's conversations in their families, have reached results which, on certain points, differ considerably from ours. Thus, while the little pupils show in their conversations coefficients of ego-centrism more or less analogous to those we have observed, M. Katz's children, talking among themselves or with their parents, behave quite differently. (pp. xxiii–xxiv)

Another explanation, favored by McCarthy (1933, 1954), is that the problem resided in the ambiguity of the classification system employed by Piaget. For whatever reason, there were notably few confirmations of Piaget's assertion that young children were predominantly egocentric in their speech. The controversy extended into the 1970s (see, e.g., Garvey & Hogan, 1973; E. Mueller, 1972), along with replications of the earlier disconfirmation of Piaget's report.

The issue was significant for the area because it had implications for the understanding of virtually all psychological aspects of development, whether cognitive, linguistic, social, or moral. Beyond the issue of whether egocentric speech was 6% or 40% or 60%, there was agreement that this form of communication tended to decrease as a function of the child's age. Why? Piaget's answer, which seemed compatible with the earlier formulations of Baldwin and Freud, was that egocentric communication directly reflected young children's "personalized" mode of thinking, and that as children became more objective in their views of themselves and of reality, the transition to socialized speech occurred. Egocentric speech became dysfunctional and was discarded. A counterproposal by the Russian psychologist L. S. Vygotsky (1939) constituted a serious challenge to the Piagetian interpretation. The key to Vygotsky's proposal is that, at maturity, two speech systems exist: inner speech and socialized speech. For Vygotsky:

> The relation of thought to word is first of all not a thing, but a process; it is a proceeding from thought to word and, conversely, from word to thought . . . every thought moves, grows and develops, each fulfills a function and solves a given problem. This flow of thought occurs as an inner movement through a series of planes. The first step in the analysis of the relationship between thoughts and words is the investigation of the different phases and planes through which the thought passes before it is embodied in words. (p. 33)

Herein lies the need for a developmental investigation of speech functions, for it may provide us with an answer as to how thought and speech are interrelated. This investigation:

> reveals, in the first place, two different planes in speech. There is an inner, meaningful semantic aspect of speech and there is the external, acoustic, phonic aspect. These two aspects although forming a true unity, have their own particular laws of movement. . . . A number of facts in the development of children's speech reveal the existence of independent movement in the phonic and the semantic aspects of speech. (1939, p. 33)

How does Vygotsky interpret the role of egocentric speech and how does his interpretation differ from Piaget's? Although egocentric speech has no apparent function of its own in Piaget's formulation—it merely reflects the child's egocentric thinking and is thereby doomed to disappear with the child's cognitive growth—it assumes great functional importance for Vygotsky. Egocentric speech constitutes, in effect, a developmental way station "a stage which precedes the development of inner speech" (1939, p. 38). It is a form of speech that aids in the young child's thought processes but, rather than waning in childhood and becoming dysfunctional, egocentric speech undergoes an evolution with "inner speech" and thought as its end product. Vygotsky (1939) wrote:

> To consider the dropping of the coefficient of egocentric speech to zero as a symptom of decline of this speech would be like saying that the child stops to count at the moment when he ceases to use his fingers and starts to do the calculations in his mind. In reality, behind the symptoms of dissolution lies a progressive development, . . . the formation of a new speech form. (p. 40)

Vygotsky then took a significant step forward in the analysis of both speech functions and their relation to thought, by conducting some ingenious experiments on the nature of egocentric speech. He went beyond naturalistic observations to manipulate theoretically relevant dimensions. He determined, for instance, that the incidence of egocentric speech decreased sharply when children were placed in the company of others who could not possibly understand them—deaf and dumb children, or children speaking a foreign language. Vygotsky reports that the coefficient of egocentric speech "sank rapidly, reaching zero in the majority of cases and in the rest diminished eight times on the average." While these findings seem "paradoxical" for Piaget's view, they were consistent with the idea that "the true source of egocentric speech is the lack of differentiation of speech for oneself from speech for others; it can function only in connection with social speech" (1939, p. 41).

To summarize the rest of Vygotsky's argument and experimental work would take us beyond the limits of this overview (see McCarthy, 1954). The story did not end in the 1930s; many of the same concerns and proposals were to reappear in the 1960s and 1970s. Unfortunately, the brilliant Vygotsky—who was born the same year as Piaget—died in 1934 at the age of 38. His developmental views were brought forward to contemporary psychology by his colleague and collaborator, A. R. Luria.

The functional analysis of language development, while most intriguing on theoretical grounds, constituted only a portion of the total research effort devoted to language. Researchers focused, in addition, on developmental stages in language expression (e.g., prelinguistic utterances, phonetic development, the growth of vocabulary, changes in syntactic complexity as a function of age) and individual differences in language development and how they arise (through experience, schooling, early exposure, etc). The literature on these matters was such that, by the end of this period, no child development text could be prepared without a significant section given to the report and summary of these findings. The mass of data seemed to outrun the ability of theorists to organize it in terms of meaningful models.

DEVELOPMENTAL PSYCHOBIOLOGY AND ETHOLOGY

The Gesellian emphasis on growth and maturation was part of a broader attempt within developmental psychology and developmental biology to unlock the secrets of ontogeny (see McGraw, 1946). On this count, the understanding of the mechanisms of genetic transfer was significantly advanced by (a) the rediscovery of the work of Mendel, and (b) the revolutionary discoveries of the loci of units of chromosomal transmission. But these events raised a significant question for developmentalists. If all somatic cells have the same genetic code, how does differentiation occur in development and why do cells at maturity have distinctly different functions and properties? Where is the "master plan" for development, and how can particular cells be induced to perform their unique and special services for the organism?

Among the embryologists who addressed these issues, Hans Spemann (1938) provided a provocative suggestion following his discoveries that cellular tissues could be successfully transplanted from one area of pre-

sumptive growth to another. If the transplantation occurs at the appropriate time in development, tissues from the presumptive area of the neural plate of amphibia could be successfully transplanted to areas where limbs would arise. The tissue would then develop in accord with its surroundings, so that the tissue would take on the characteristics of skin or muscle, not of the brain. On the basis of these experiments, Spemann proposed that extranuclear or contextual forces served to "organize" the development of cellular materials in the course of ontogeny. Once organization occurred, during the period that was critical for the development of its form and function, then the effects would be irreversible or highly resistant to change (see Waddington, 1939).

Such demonstrations provided the substantive empirical examples for the formulation of a view on development that has come to be known as "organismic" theory or "system" theory of biological development (von Bertalanffy, 1933). In its initial form, organismic theory was concerned with the question: What directs development? The answer, simply stated, is: the organism. Development is directed by the constraints inherent in the relationship among elements of the living system as they act on themselves and on each other. These elements can be cells, clusters of cells, or entire subsystems, such as those formed by hormonal processes. The kernel idea is that the several features of the organism, including its behavior, depend on the whole reciprocating system of which they form parts. The mutual regulation among components permits, among other things, possible feedback to the original source and self-regulation.

Organismic theory was compatible with the Darwinian perspective of evolution as a dynamic, adaptive process. Development is equally dynamic. It required only a modest conceptual leap to consider behavior as being an essential component of the organismic system, and its development could be understood only in terms of other biological and social features of the system. Hence, the "system" in which the organism developed was not merely under the skin. Organization could be broadened to include feedback from other organisms and from the social network in which development occurred. Two developmental-comparative psychologists, T. C. Schneirla and Zing-Yang Kuo, led the way, in the early 1930s, for the application of the organismic perspective to the problems of behavioral ontogeny.

The problem that Schneirla tackled was how to unravel the complex social structure of army ants, who despite their lack of gray matter, were highly coordinated in virtually all phases of their adaptation. Wilson (1975) considers the species as a prototypic "truly social" one. How is the high level of social organization accomplished? Schneirla (1933) attacked the problem by undertaking a series of comprehensive field investigations in Panama and laboratory studies in his facilities at the American Museum of Natural History. He tested the assumption that colony organization does not arise from some single internal source; rather, the complex social system arises as an outcome of the interdependence of developmental events in the brood, workers, queen, and the contextual environmental constraints.

Schneirla identified the pattern of empirical relationships that provided elegant support for his developmental analysis of social organization. He discovered, for instance, that a primary trigger for migration and foraging raids in the colony was the heightened activity produced by the developing larvae. When the larvae emerged from the quiescent phase of development, their activity stimulated the rest of the colony to action, keying both foraging raids and migration. When the activity of the larval brood diminished as a consequence of growth-related changes, the raids ceased and the nomadic phase ended. The surplus food that then became available in the colony (due to decreased needs of the young) fattened the queen and served to trigger a new ovulatory cycle, thus recreating the conditions for reproduction. Looking backward on this work, Schneirla (1957) concluded: "The cyclic pattern thus is self-rearoused in a feedback fashion, the product of a reciprocal relationship between queen and colony functions, not of a timing mechanism endogenous to the queen."

Z.-Y. Kuo, a Chinese psychologist who completed his doctoral training with E. C. Tolman at Berkeley before returning to work in China, came to similar conclusions at about the same time. Kuo was originally motivated by J. B. Watson's claims about the malleability of behavior, given the control over the conditions of development. He went beyond Watson and collected relevant data. In a series of provocative studies, where he produced unique environments for the young animals to grow up in, Kuo demonstrated that key features of social patterns could be changed, and novel ones created. Cats, for instance, could be made to "love" rats, not kill them, if the kittens were raised together with rodents from infancy onward (Z.-Y. Kuo, 1930, 1967). Beyond behavioral plasticity, Kuo addressed the fundamental problem of behavioral origins, and when and how novel behavior patterns arise in the course of ontogeny.

In his study of the origin of "instinctive" behaviors, such as pecking, vocalization, and movement patterns in birds, Kuo assumed that these characteristics arose in development because of necessary feedback relationships among central nervous system, physiological, and behavioral functions. Pushing the organismic proposal on the self-stimulative role of behavior to its limits, Kuo offered the proposal that the behavior of the embryo itself provided feedback that would help to direct its subsequent development. Preyer (1888–1889) had earlier suggested the possibility of such feedback effects in development, but there were scant data relevant to the proposal.

The story of how Kuo explored these ideas can be found in a series of papers that he published during the 1930s, and a summary appears in his later volume on behavioral development (e.g., Z.-Y. Kuo, 1930, 1939, 1967). He first had to solve the problem of how to keep embryos alive while viewing their development (he invented a way to produce a "window" by removing the external shell but keeping the embryo and the membranes surrounding it intact). Kuo was then able to plot, from the onset of development to hatching, the movement patterns in the egg, including the initial stages of heart activity, breathing, limb movement, and pecking. On the basis of these observations, he concluded that the activity of the organism itself was influential in determining the direction of development, including leg coordination and pecking. The initial report of these observations met initial skepticism (e.g., Carmichael, 1933), and for good reason. Some of Kuo's speculations have not been upheld because he did not give sufficient weight to the effects of spontaneous central nervous system innervation in producing cycles of activity and inactivity (Oppenheim, 1973). But his more general assumption that feedback functions can contribute to embryonic development has in some instances been strikingly confirmed. For example, inhibition of leg movement in the chick embryo has been found to be associated with ossification of the joints and difficulty in posthatching mobility (Drachman & Coulombre, 1962). Moreover, self-produced vocal calls by the embryo facilitate the development of posthatching species-typical preferences (Gottlieb, 1976).

As powerful as were Schneirla's and Kuo's demonstrations of the utility of a developmental approach to behavior, they had little immediate effect on child psychology (although Kuo's work was discussed at length by Carmichael, 1933, in the revised *Handbook of Child Psychology,* and Schneirla was a reviewer for the same volume). Not until the next generation was their essential message heard and understood in both comparative and developmental psychology.

Another psychobiological researcher had greater immediate success and visibility. Leonard Carmichael carried the psychological tradition of William Preyer into the 1930s. His *Handbook* chapters (Carmichael, 1933, 1946) provided a scholarly reminder of the unsolved problems of the relations between biological development and behavioral establishment. Carmichael also brought to the attention of child psychologists the impressive body of literature concerned with the analysis of early biological-behavioral development. The chapter by Myrtle McGraw (1946) provided an excellent critical overview of the basic issues of developmental psychobiology.

In Europe, the study of the "biology of behavior," or ethology, experienced a rebirth in Konrad Lorenz's article, "*Der Kumpan in der Umwelt des Vogels*" (1935; translated and published in English in 1937). In this paper, Lorenz reasserted the contribution of evolutionary forces in the determination of behavior, and reminded biologists and psychologists of the importance of early experience and its possible irreversibility. Building on the foundation laid at the turn of the twentieth century by an American, C. O. Whitman, and a German, O. Heinroth, Lorenz offered a convincing argument for studying instinct and the evolutionary basis of behavior. Taking U.S. behaviorists head on, Lorenz argued that the effects of experiences in the "critical period" could not be accounted for in then-available principles of learning and association. Specifically, he distinguished the phenomenon of imprinting (the establishment of filial preferences and species identification in precocial birds) from "association learning" on four counts. Imprinting (1) occurred only during an early critical period, (2) was irreversible in later development, (3) was supraorganismic in its effects (not limited to the imprinted object but to the species of which the object was a member), and (4) took place prior to the developmental appearance of the response that was "conditioned" (e.g., sexual preferences were influenced, even though they were not present in infancy). Virtually no immediate notice was taken of ethological work by developmental psychologists; the gulf between disciplines, combined with World War II, delayed the introduction of these ideas into the mainstream of psychological and developmental thought.

THEORETICAL TRENDS OF THE MIDDLE PERIOD

What theoretical activity took place over this third of the twentieth century? A great deal, for each of the major developmental models established in the previous period underwent revision, modification, and extension. Behaviorism was liberalized and enlivened by a marriage with psychoanalysis. Psychoanalysis itself was split into three recognizable subdivisions: (1) classical psychoanalysis (Munroe, 1955), (2) postpsychoanalytic theory, and (3) neopsychoanalytic theory. Similarly, the Baldwinian approach to cognitive and social development was partitioned and extended: (a) in the theory of mental development now associated with Jean Piaget; (b) in the symbolic interactionism movement in sociology, anthropology, and psychiatry; and (c) in Vygotsky's expansion of the proposal that "each child is part someone else, even in his own thought of himself."

Although Piaget and Vygotsky have been the most prominent representatives of the Baldwinian developmental tradition in the United States, Henri Wallon (1879–1962) became almost as prominent in Eastern Europe, Africa, South America, and, foremost, in France. But then, and now, he has received virtually no recognition from the English-speaking world. His student, René Zazzo (1984, p. 9) observes: "As a direct descendant of J. M. Baldwin and a precursor of the theoreticians of attachment, Wallon viewed the other person as basic and primary" (see also Wallon, 1984b). In brief, Wallon argued for a more integrative, more interactive, and more social view of the developing organism than did his contemporary and competitor, Jean Piaget (see Birns, 1984, pp. 59–65; Piaget, 1984; Wallon, 1984a).

Nor was behavioral Darwinism overlooked. The foundations for modern ethology had been laid by Whitman in America and Heinroth in Europe, and extended in the 1930s and 1940s by Lorenz and Tinbergen. The "organismic" approach affected theories in biology and psychology. Most immediately related to developmental concerns were the developmental psychobiological theory of Schneirla and Kuo and the cognitive-organismic principles of Stern, Lewin, and Werner. At first blush, it seemed as if Baldwin's vision that "every man have his theory" had been fulfilled.

Except for some intrafamilial squabbles, there were few direct confrontations or face-offs among the major theories—not so much out of mutual respect as because of selective inattention. As A. Baldwin (1967/1980) has observed, developmental theories tended to talk past each other rather than at each other; they had different aims, were concerned with different issues, employed different methods, and were challenged by different findings. In due course, as the interests and concerns of the discipline shifted, each of the general orientations was to experience its day in the sun.

A few comments are in order on three major theoretical systems of the period that have not yet been singled out for attention: social learning theory, psychoanalysis and its derivatives, and Lewinian "field theory."

Social Neobehaviorism

The family of theories called "social learning" descended from a wedding of the general behavioral models of the 1930s and psychoanalytic ideas of personality. During the heyday of general behavioral systems, four models of learning emerged as especially influential: (1) the behavior system of Clark Hull (1943), (2) the contiguity learning model of E. R. Guthrie (1935), (3) the purposive behaviorism of E. C. Tolman (1932), and (4) the operant learning theory of B. F. Skinner (1938, 1953). Despite their differences in language and in basic assumptions about the nature of learning, the models shared the belief that the principles of learning were universal, transcending differences in species, age, and circumstances.

Beyond a faith in the universality of the basic principles of behavior, there was a need to specify the implications of these theories for distinctly human problems, including the acquisition of personality patterns and social dispositions. J. B. Watson led the way early in offering bold speculations about the learning and unlearning of fears and loves. The challenge to the writers of the 1930s was to provide a more systematic, and yet equally convincing, case for the learning of significant human behaviors. To this end, a group of able young scientists at Yale University set about to put the study of personality processes on a solid empirical and behavioral basis (Maher & Maher, 1979). This group attempted to link certain concepts of psychoanalysis with assumptions drawn from the general behavioral theory of Clark Hull. The upshot was a remarkably influential set of concepts that was to dominate theoretical formulations in child psychology for the next several decades.

The first major collaborative effort was directed at the analysis of the controls of aggressive patterns, as

viewed from a psychoanalytic-behavioral perspective. The product of this collaboration, a slim volume entitled *Frustration and Aggression,* appeared on the eve of World War II and gained immediate attention and influence (Dollard, Miller, Doob, Mowrer, & Sears, 1939). Although the basic hypothesis that "aggression is always a consequence of frustration" (p. 27) was soon amended by the authors themselves (see Miller, Sears, Mowrer, Doob, & Dollard, 1941), the idea behind the work was enthusiastically endorsed. The associationistic assumptions of psychoanalysis were neatly melded with the stimulus-drive assumptions of Hullian theory.

The direct application of concepts of learning and imitation to children was soon made by Miller and Dollard (1941) in their book *Social Learning and Imitation.* This was not the first such extension; the Sears study of infant frustration (cited in Dollard et al., 1939), and Mowrer's study of enuresis (1938) had already shown that social learning principles could be readily applied to problems of child development. After World War II, the full impact of the social learning perspective was to be felt by child psychology.

Psychoanalysis

By the 1930s, the enterprise of psychoanalysis had undergone multiple divisions and had exercised a significant impact on the study of behavioral development. The most obvious influence was direct, through the teachings of Sigmund Freud himself and those who remained faithful to the orthodox theory. But equally powerful influences were indirect, mediated through the theories of those who—like J. B. Watson, J. Piaget, and R. R. Sears—had been impressed by particular features of psychoanalytic theory. In between were the so-called post-Freudians (those who extended psychoanalytic theory within the constraints established by Freud himself) and neo-Freudians (those psychoanalysts who revolted by challenging certain inviolable assumptions, such as the emphasis on infantile sexuality and the primacy of early experience). These various themes have been expertly traced in discussions of psychoanalytic theory (e.g., Hall & Lindzey, 1957; Munroe, 1955). For our present purposes, some comments on the relation between psychoanalysis and the study of behavioral development are in order.

By the late 1930s, psychoanalysis appeared to many child psychologists to be the answer to their search for a unifying theory of development. One of the more influential writers on the matter was Freud's daughter, Anna Freud. Her view on the adequacy of the theory for understanding personality development—indeed, all features of development—was unambiguous and uncompromising. In the chapter that she prepared for the first edition of *A Handbook of Child Psychology,* Anna Freud (1931) wrote:

> Psychoanalysis does not permit itself to be ranged with other conceptions: it refuses to be put on an equal basis with them. The universal validity which psychoanalysis postulates for its theories makes impossible its limitation to any special sphere such as the conception of the neurotic child or even the sexual development of the child. Psychoanalysis goes beyond these boundaries, within which it might even have been granted the right of judgment, and encroaches upon domains which, as demonstrated by the table of contents of this book, other specialists consider their own. (p. 561)

Psychoanalysis would settle for nothing less than the whole pie of developmental psychology, and it came close to getting it in one form or another through the rest of the twentieth century.

It seemed inevitable that empirically minded U.S. psychologists would attempt to put some of the key propositions of the theory to experimental test—indeed, the enterprise attracted some of the best young scientists in psychology. What did they find? In summing up the then-available results of the experimental assessments of fixation, regression, projection, and other psychoanalytic mechanisms, Sears (1944) wrote:

> One is driven to the conclusion that experimental psychology has not yet made a major contribution to these problems. . . . It seems doubtful whether the sheer testing of psychoanalytical theory is an appropriate task for experimental psychology. Instead of trying to ride on the tail of a kite that was never meant to carry such a load, experimentalists would probably be wise to get all the hunches, intuitions, and experience possible from psychoanalysis and then, for themselves, start the laborious task of constructing a systematic psychology of personality, but a system based on behavioral rather than experiential data. (p. 329)

All this is to say that the experimental testing of psychoanalytic proposals was not a profitable enterprise. Sears was to follow his own advice, as we shall see, and would pave the way for the modern generations of social learning theory.

Despite the equivocal returns on the scientific analysis of the theory, its influence gained, not faded, during the 1930s and 1940s. Virtually every major theoretical system concerned with human behavior—save those that dealt with purely physiological, motor, or sensory phenomena—was accommodated to psychoanalytic theory. Behaviorism (whether "radical" Watsonianism or conventional Hullian theory) and Piagetian cognitive theory alike were significantly influenced in that era, just as ethology and social learning theory were influenced in the present one. The immediate effects on child-rearing practices were as great, if not greater, than the earlier ones associated with Holt and Watson. With the publication of the first edition of Benjamin Spock's (1946) best-selling manual on infant care, the U.S. public was encouraged to adopt practices not inconsistent with psychoanalytic training. The rapid growth of professional clinical psychology—World War II had demanded specialists in diagnosis and therapy—also underscored the need for a theory of assessment and treatment. The major tools available for the task included projective tests (typically based on psychoanalytic assumptions) and methods of psychotherapy (derived, directly or indirectly, from the psychoanalytic interview). Psychology as a profession and a science became increasingly indebted to psychoanalytic theory and practice.

But psychoanalysts themselves proved to be an intellectually heterogeneous lot, and the theory could hardly be viewed as a static, unchanging view of personality. Among the more prominent heretics were Carl Jung, Alfred Adler, Karen Horney, Eric Fromm, and Harry Stack Sullivan. They shared in common an emphasis on the interpersonal implications of dynamic theory, as these were expressed in the family system and in interpersonal exchanges of later childhood and maturity. With this focus on "object relations," there was a concomitant de-emphasis on the importance of infantile sexuality and the reversibility of very early experiences (see Munroe, 1955). Horney (1937) and Sullivan led the way in the neo-Freudian theory of interpersonal relations. In 1940, in a lengthy article in *Psychiatry,* Sullivan outlined a rapprochement between theories of symbolic interaction that had become associated with sociology and anthropology and a neoanalytic interpersonal theory of psychopathology. Sullivan's position was that the "self-dynamism" arises from "the recurrent interpersonal situations of life." Ideas about the self-dynamism (which is not an entity but a process) are derived from the interpersonal settings of life and depend, in large measure, on the "consensual validation" of the views of "significant others" with whom one interacts. Because of the continuing impact of the social system on one's behavior and one's thought of oneself, the development of personality is a continuing, ongoing process. Sullivan's views had a significant impact on subsequent sociological (Cottrell, 1942, 1969), psychiatric (G. Bateson, Jackson, Hayley, & Weakland, 1956; Jackson, 1968), and psychological models of social interaction.

Field Theory and Ecological Psychology

When Kurt Lewin immigrated to the United States in the early 1930s, he had already established himself as a distinguished child psychologist in Germany. U.S. readers were first introduced to his powerful theory of "behavior and development as a function of the total situation" in two articles that appeared in English in 1931. In his classic theoretical paper, "Conflict between Aristotelian and Galileian Modes of Thought in Psychology" (1931a), Lewin offered an elegant defense for studying individual children in the actual, concrete, total situation of which they are a part. He argued that the dynamics of behavior—the study of the forces that exercise momentary control over the direction and form of actions—cannot be clarified by the use of standard statistical methods. Averages that are obtained by combining the results of large numbers of children in a "standard" environment are bound to obscure the precise dynamic controls of behavior, not clarify them. "An inference from the average to the concrete particular case is . . . impossible. The concepts of the average child and of the average situation are abstractions that have no utility whatever for the investigation of dynamics" (Lewin, 1931b, p. 95). Lewin provided a rationale for the conclusion that had been arrived at intuitively by some of his most insightful predecessors (Preyer, Binet, Freud, and Piaget). The conclusion stood in sharp contrast to that arrived at by Galton and most U.S. psychologists.

Lewin's ideas about method were consistent with his theoretical position on the contextual relativity of psychological experience and action. A key element in Lewin's theorizing was his emphasis on the *psychological* environment as opposed to the physical or objectively determined concrete environment. Lewin observed, "All these things and events are defined for the child partly by their 'appearance' but above all by their 'functional possibilities' (the *Wirkwelt* in v. Uexküll's sense)"

(1931b, p. 100). In endorsing animal behaviorist J. von Uexküll's emphasis on the individual's reconstructed inner space (the *Umwelt* and the *Innenwelt*) as opposed to the objective mechanical forces of the external world (see Loeb, 1912/1964), he captured an idea whose implications have yet to be fully realized. Lewin formulated his psychological field theory in keeping with the gestalt and system theoretic approaches. Although behavior is seen as a function of both the person and the environment, these two major variables "are mutually dependent upon each other. In other words, to understand or to predict behavior, the person and his environment have to be considered as *one* constellation of interdependent factors. We call the totality of these factors the life space *(LSp)* of that individual" (Lewin, 1954, p. 919). Lewin's theory was basically a model of action, to account for the directionality of behavior in terms of the forces present in a given psychological environment. But the effective forces belong neither to the person nor to the field alone; actions can be understood only in the totality of forces as they are merged to determine behavior.

In his work in the United States in the 1930s and 1940s, Lewin extended this theoretical model to diverse social and developmental phenomena, including the analysis of conflict, social influence, level of aspiration, and goal setting, as well as the effects of autocratic and democratic environments. Beyond their influence on specific research programs, Lewin's principles of behavior and development became incorporated into the discipline without being identified with his particular school of thought. For instance, his "field theory" demanded attention to the context in which behavior occurred and, particularly, the individual's personal response to that setting. The "environment" was not merely the physical and social context, but the child's perception of that setting. So one and the same "objective" environment may be perceived differently, according to the needs of the child and the forces that operate on him or her; conversely, seemingly identical responses may reflect the operation of quite different psychological forces. There is a contextual relativity to both stimuli and responses, and neither should be divorced from the social/environmental matrix in which each is embedded.

This overview does not permit an account of Lewin's developmental and social theory (excellent summaries may be found in A. Baldwin, 1967/1980, and Estes, 1954). It should be noted that Lewin and the Lewinians pioneered in the study of conflict resolution (Lewin, 1935), level of aspiration (Lewin, Dembo, Festinger, & Sears, 1944), small group processes (Lewin, Lippitt, & White, 1939), and the effects of interruption and frustration (R. G. Barker, Dembo, & Lewin, 1941). One of Lewin's postdoctoral students, Roger Barker, carried the essential concepts of ecological psychology to the next generation (R. G. Barker, 1963, 1964, 1968). Urie Bronfenbrenner (1979) has been enormously influential in extending the essential ideas (Bronfenbrenner, 1979, 1993, 1995). Furthermore, other students inspired by Lewin virtually sculpted the face of modern social psychology. There was also an immediate and direct connection to developmental psychology. Marian Radke Yarrow, an eminent developmental psychologist, was Lewin's protégé at MIT, where she taught the graduate seminar on Lewinian theory to H. Kelley, J. Thibaut, and M. Deutsch, among others.

What did Lewinian theory not cover? Criticisms of field theory note that relatively little attention is given to the processes of enduring change—namely, those of learning. Although Lewin clearly acknowledges that "somatic" changes in the child can have a significant influence on the psychological environment, field theory gives only modest attention to how such developmental changes may be integrated with modifications in psychological forces. Hence, the model is exceedingly convincing as a descriptive model, but how it may be critically tested, modified, and falsified is less clear. Lewin's emphasis woke psychology from its behavioristic slumbers by pointing out that the context-free objective "stimulus" may be an illusion. The implications for methodology and theory, especially in the study of social development and social psychology, were enormous.

COMMENTS ON THE MIDDLE PERIOD

It seems ironic that the most notable development in child psychology during this period was brought about initially by social and economic forces instead of scientific advances. Child research institutes were founded throughout the United States, and, once established, they became enormously influential in the science and remained so throughout the better part of the twentieth century. Behind the foundations and the governmental-university agencies that provided the actual financial support for the institutes, there was a broad nationwide coalition of concerned teachers and parents who pressed

for more attention, scientific and otherwise, to the needs of children. This was the same social/political "movement" that had been given early form and direction by Hall in the 1880s and 1890s. But the establishment of study centers did not a science make, and investigators were immediately challenged to develop more adequate procedures in virtually every sector of child research. Each area of study—intelligence, honesty, emotionality, language, thinking, perception, growth, predictability—presented its own problems of methodology and analysis, and each had to be solved in its own terms. The upshot was an inevitable fragmentation of developmental study.

What were the empirical advances in the period? To attempt to answer that question would be tantamount to compressing the information contained in the three compendia edited by C. Murchison (1931, 1933) and L. Carmichael (1946). Beyond the demonstration that almost all aspects of child behavior and cognition could be profitably studied by empirical procedures—something that had been promised but not demonstrated in the earlier period—we find substantive findings that perplexed the researchers themselves and seemed to defy integration with earlier concepts of the child. These phenomena included the specificity of honesty, the rapid conditionability of fear in infants, the egocentricism of children, the physical normality (or superiority) of bright children, and the modest predictability of behavior over time and space. Spectacular controversies were ignited by studies of early experience that purported to show that children's basic intellectual adaptations could be influenced by especially beneficial or neglectful early experiences. Perhaps more important for the science than controversy were the less dramatic yet critical advances in describing the "normal" (i.e., species-typical) course of sensorimotor, cognitive, and behavioral development.

Theoretical activity in this period proceeded at two "levels," specific and general. At the first level, the empirical advances—methodological and substantive—produced information that demanded attention and integration. Hartshorne and May (1928) offered their "specificity" proposal on altruism and honesty; C. Bühler (1931), her account of three social "types" in infancy; F. Goodenough (1931), her explanation for the development of anger and quarrels; J. Anderson (1939), his hypothesis on the "overlap" in successive tests of infant competence; and so on. These data-based hypotheses constituted a necessary step between empirical studies of child behavior and the overarching theoretical conceptions that had stimulated the research in the first place.

At the second level, various attempts were made to establish a general integrative theory of development to fill the void left by the collapse of the recapitulation hypothesis. For every general developmental theory that vied for hegemony in the 1920s and 1930s, a straight line may be drawn backward to antecedent models of the 1880s and 1890s. The cognitive-developmental proposals of J. Piaget, L. S. Vygotsky, H. Wallon, and H. Werner were immediately linked to the concepts of J. M. Baldwin; the developmental psychobiology of Z-Y. Kuo, T. C. Schneirla, and L. von Bertalanffy followed the prior conceptual advances in animal behavior and experimental embryology; the maturational model of A. Gesell constituted in several respects an extension of the developmental views of W. Preyer; the scientific basis for Watsonian behaviorism was established by the prior work of Morgan, Loeb, and Jennings, among others; and the several versions of psychoanalysis each retained some central elements of the parent theory.

Despite obvious differences among the above models, they shared a similarity in that they were, in a basic sense, developmental. Differences among them arose on assumptions about how developmental processes might be most adequately described and how behavioral phenomena might be most appropriately conceptualized. These assumptions, in turn, reflected which behavioral or cognitive phenomena were addressed by the theory, and in which species. Although psychoanalysis gained a clear edge in popular recognition and clinical applications, organismic models became quietly influential in the research of psychobiological and cognitive investigators. But none of the models achieved clear dominance, and the science could not claim as its own a unifying theory of behavioral development that might complement or extend the theory of biological evolution. Indeed, advances in identifying the contextual events that determined actions and learning raised questions on whether a general theory of behavioral development was possible.

THE MODERN ERA

Following a general depression in research activity during World War II, work on behavioral development began an upward slope in the postwar period and has only recently shown signs of leveling. A new "golden

age" began for the discipline and it has surpassed those of the two previous eras (1895–1905 and 1925–1935). New techniques and approaches were introduced in rapid succession, stimulated in part by advances in electronic recording, coding, and computer analysis. The effective "life span" of research methods—from new projective procedures to questionnaires on authoritarianism or brief experimental procedures for studying learning—appeared to have been shortened from about 15 to about 10 years. Promising ideas—on test anxiety, social reinforcement satiation, impulsivity, and modeling—entered rapidly, dominated the area briefly, then faded away, often without a decent postmortem or obituary.

In large measure, the quickened pace of research activity and analysis could be attributed to great increases in federal support for empirical research and the opening of new teaching and research positions. A new institute established by the National Institutes of Health (NIH) was devoted to research on child health and human development, and other institutes accepted a developmental orientation to understanding problem behaviors (e.g., National Institute of Mental Health, National Institute of Drug Abuse). In addition, the U.S. Congress funded an unprecedented national program to provide poor and disadvantaged children with a "Head Start" prior to school entry. Two psychologists, Urie Bronfenbrenner and Edward Zigler, were instrumental in initiating the program and directing it through its early years. Other developmental psychologists were involved in the creation of television programs to enhance education and learning (e.g., *Sesame Street*). This period has been one of expansion, invention, and criticism, with new innovations and discoveries in virtually all areas of developmental research and application.

One of the more visible early theoretical trends in this period was the rise, domination, and passing of general learning theories. Until their grip began to fail in the early 1960s, behavioral models of learning were hegemonous in U.S. psychology, and developmental psychology was no exception. To enter the theoretical mainstream, research in the several areas of child study, from language acquisition and cognitive learning to social behavior and child rearing, had to be couched in learning terms. Behaviors did not develop, they were acquired. Despite their austere and parsimonious construction, learning models appeared to be remarkably adaptable for developmental psychologists—but not adaptive enough. By the mid-1960s, the area began to rediscover the dynamic developmental models on which the field had been established. They appeared in quite different forms in studies of language and cognition, in investigations of basic motor and perceptual processes, and in longitudinal studies of social and personality development. The area also rediscovered the basic psychoanalytic assumption that the first relationships were critical for understanding psychopathology and the core features of personality.

Many of the ideas and problems that had been pursued over the first half of the twentieth century came again to the forefront, from the study of growth patterns in motor and sensory development, in cognitive changes in thought and language, and in the effects of interactions on social and personality development.

This section of developmental history overlaps with contemporary events, including those covered in other chapters of this edition of the *Handbook*. The closer one comes to current trends, the more difficult it is to disentangle ephemeral interests from enduring changes. Hence, we leave for a final section of this chapter our perception of about the last 20 years of developmental science (the final decade of the twentieth century and much of the 1st decade of the present century). Here, however, on more secure historical ground is a discussion of some of the shifts that have occurred in developmental science up through the 1980s that helped shape the contemporary trends within the field. The focus is on three domains: (1) social learning theory, (2) attachment theory, and (3) cognitive development.

SOCIAL LEARNING: RISE, DECLINE, AND REINVENTION

Contrary to general impressions, there is no single "social learning theory"; there are several. The plurality came about initially because there was only modest consensus on which principles of learning were universal. Over the past half-century, a number of social learning theories have evolved from the basic frameworks established by Skinner and the neo-Hullian theorists, each with its distinctive emphasis and adherents. It has been a complex and often misunderstood endeavor, and we comment here only on some of the historical highlights.

Rise

Robert R. Sears can be recognized as the person whose influence was pervasive in the introduction of the psy-

choanalytic learning synthesis to the study of children. One of the original members of the Yale group that created neo-Hullian social learning theory (Dollard et al., 1939; Miller et al., 1941), Sears was a pivotal influence for students and colleagues at the Iowa Child Welfare Research Station, Harvard University, and Stanford University. With his colleagues at these institutions, many of whom went on to develop influential revisions of social learning (including E. E. Maccoby, J. Whiting, V. Nowlis, J. Gewirtz, Richard Walters, A. Bandura, and Sears's wife, Pauline Snedden Sears), Sears was instrumental in bringing about major changes in the scope and concerns of developmental psychology.

In the first major publication to come from this group (Sears, Whiting, Nowlis, & Sears, 1953), "aggression" and "dependency" were seen as motives that were learned early in the life history of the child. How were they learned? The answer was not an easy one, at least not for Hullians, because the theory of conditioned drives had not been elaborated by Clark Hull (1951) and had been only vaguely outlined by Freud. Drawing from both of these views, Sears and his colleagues argued that these key social motives were acquired as a universal consequence of the early familial experiences of the child. Moreover, variations in the strength of the drives and in their expression were produced by differences in the quality of the parent-child relationship, as indexed by the rewards, punishments, and frustrations that occurred in the mother-child interaction. This social learning theory was extended to account for the development of gender role-typing (through internalization of parental values and self-reinforcement) and conscience (through nurturance and the withdrawal of love by the mother).

The semistructured interview technique was extensively employed to investigate parental attitudes, beliefs, and child-rearing practices. Large-scale studies were conducted by Sears and his colleagues in Iowa, Massachusetts, and California (Palo Alto). One aim was to replicate key findings at each of the three sites by using a common research technique. Employing lengthy in-depth interviews with parents as a primary research technique, these studies attempted to relate child-rearing practices with assessment of children's social behavior and personality patterns. The assessments of children capitalized on advances that had been made in observational methodology, and revised or developed child-appropriate "projective test" measures. Instead of using inkblots or semistructured pictures, the investigators used dolls and dollhouses to permit the preschool child to reconstruct the nuclear family (Bach, 1946). The interview and observational procedures provided the model for a wide range of cross-cultural and cross-age studies (e.g., Whiting & Whiting, 1975).

One of the great strengths of social learning theory and its practitioners was their openness to data, whether supportive or disconfirmatory. Hence, the original statement underwent revisions, both modest (e.g., Sears, Maccoby, & Levin, 1957; Sears, Rau, & Alpert, 1965) and major (e.g., Bandura & Walters, 1959; Whiting & Whiting, 1975), in attempts to extend it and correct its shortcomings.

Decline

What were the shortcomings? Some were identified by the investigators themselves in three large-scale studies of child rearing conducted in Iowa, Massachusetts, and California. When the results of the 20-year research effort were compiled and analyzed, the outcomes provided only modest support for the theory that had inspired the work. The problem was that there were few reliable correlates between variations in child-rearing practices and the children's social behavior and personality patterns.

Eleanor Maccoby, a key participant in this work, indicated that the problem lay as much in the theory as in the method. Looking backward after 35 years, Maccoby (1994) wrote:

> Few connections were found between parental child-rearing practices (as reported by parents in detailed interviews) and independent assessments of children's personality characteristics—so few, indeed, that virtually nothing was published relating the two sets of data. The major yield of the study was a book on child-rearing practices as seen from the perspective of mothers (Sears et al., 1957). This book was mainly descriptive and included only very limited tests of the theories that led to the study. Sears and colleagues later conducted a study with preschoolers focused specifically on the role of identification with the same-sex parent in producing progress toward social maturity. They used a much expanded range of assessment techniques, including observations of parent-child interaction. The hypothesis that identification with parents was a primary mechanism mediating children's acquisition of a cluster of well-socialized attributes was, once again, not supported. (see especially Sears et al., 1965, table 40, p. 246)

Not all of the outcomes were negative, nor were all unreliable. But the overall pattern of the findings provided

scant support for the ideas that had inspired the work in the first place. What was to blame—the theory or the methods employed to test it? The methods could be criticized, and so could the theory.

In an incisive and courageous evaluation published at the height of the social learning era, Marian Radke Yarrow and her colleagues wrote:

> Childrearing research is a curious combination of loose methodology that is tightly interwoven with provocative hypotheses of developmental processes and relationships. The compelling legend of maternal influences on child behavior that has evolved does not have its roots in solid data, and its precise verification remains in many respects a subject for future research. The findings from the preceding analyses of data make it difficult to continue to be complacent about methodology, and difficult to continue to regard replication as a luxury. The child's day-to-day experiences contribute significantly to his behavior and development and are in many respects the essence of developmental theory. An exact understanding is important to science and society. In attempting to build on this knowledge, each researcher is a methodologist and as such has a responsibility for excellence. (Yarrow, Campbell, & Burton, 1968, p. 152)

Two noteworthy contributions by Sears and his colleagues require mention. In a presidential address to the American Psychological Association, Sears (1951) brought renewed attention to the theoretical concept of social interaction and the bidirectionality of familial relations. Although the research methods employed by the Sears group made it difficult to study interactional phenomena directly, these concepts figured importantly in the conceptions that were offered in each of Sears's major subsequent publications. They provided the impetus for renewed attention to the issues that had been initially raised by James Mark Baldwin, and were then represented in the work of psychiatrist H. S. Sullivan (1940, 1953) and sociologist Leonard Cottrell (1942).

The second contribution was the reintegration of child development research into the mainstream of psychology, a position that it had not held for most of the previous half-century. By linking the study of children to the then-current theoretical systems of psychology, the door was opened for a fresh generation of psychologists to enter the field. The gains were not without cost, however, in that much of the earlier developmental work was set aside or ignored by the new group. Traditional developmental studies, as embodied in the chapters of successive editions of the Carmichael *Manual,* were seen as irrelevant for the basic issues of social learning and social control. Instead of descriptions of developmental change, this generation of developmentalists was concerned with explanations of change in terms of the "new" concepts of social interchange, imitation, dyadic analysis, dependency, aggression, and conscience. Overlooked in the social learning revolution was the fact that each of these concepts had been familiar to the founding generation, and the phenomena to which the concepts refer had been extensively researched in the next generation.

Coming back to the evolution of social learning theories, we find that, in the early 1960s, the movement was split into two major divisions, each of which was in intellectual debt to the parental movement and to the reinforcement concepts of B. F. Skinner (1953). J. Gewirtz, S. Bijou, and D. Baer (Bijou & Baer, 1961; Gewirtz, 1961) followed Skinner's lead in applying the ideas and concepts of operant conditioning to analyses of behavior modification in normal and retarded children. But there were problems in negotiating the theoretical transition from pigeons to children. Just as the concept of "conditioned" or "learned motivation" had presented difficulties for the initial social learning theories, the notion of "conditioned" or "social reinforcement" proved to be an enigmatic concept for the operant revision (see Gewirtz & Baer, 1958; Parton & Ross, 1965).

Reinvention

The resurgence of social learning theory was led by Albert Bandura and Richard Walters (1963), who shifted the substantive and explanatory basis of the model. They argued that the wedding of learning concepts to psychoanalysis tended to shortchange both models. Social learning should exploit learning mechanisms, including cognitive processes that govern imitation and reinforcement. In their work, "modeling" was seen as a primary mechanism for the acquisition of novel actions and, as such, a key to understanding socialization and transgenerational transmission. They had, in effect, reinstituted the construct of "imitation" to the nuclear role that it had played in J. M. Baldwin's formulation.

The next modification in social learning theory came shortly afterward, when Albert Bandura revitalized the theory and established it on a foundation of distinctively human, cognitive processes. The need for further revision arose when it became clear that the short-term

studies of imitation and social learning of children were open to alternative, cognitive interpretations. For instance, examination of the determinants and outcomes of modeling (i.e., imitation) in children indicated that children did not behave in a fashion that was analogous to observation learning in animals. A similar phenomenon was observed in the effects of social reinforcement (i.e., verbal reward) with children. Marked variations in reinforcer effectiveness could be induced simply by instructions or other cognitive manipulations, leading to the interpretation that "social reinforcement" in children may more appropriately be viewed in terms of information transmission processes than primary reinforcement processes (see Paris & Cairns, 1972; Stevenson, 1965). Other "information" interpretations of punishment, dependency, and conscience appeared (e.g., Walters & Parke, 1964). A similar revision was made in the interpretation of imitation and modeling, for parallel reasons (Bandura, 1969). Patterson (1979) extended observational methods in inventive ways; hence, paved the way for precise assessments of social learning hypotheses.

Along with Rotter (1954) and Mischel (1973), Bandura shifted the focus of social learning from preoccupation with psychoanalytic conflicts and anxieties to the positive, productive features of children. With the concepts of self-efficacy and self-regulation, he affirmed the distinctive qualities of human adaptation, and he shifted the focus of the orientation from human problems to human potential. But these are not opposed foci in Bandura's revision of social learning theory. On this score, Grusec (1994) observes:

> Bandura's interest in self-efficacy arose from his studies of the role of participant modeling in the treatment of phobic disorders. A striking feature of the outcomes of these studies was the extent to which individuals' perceptions of their own feeling of effectiveness determined how easily changes in behavior and fear arousal were achieved and maintained. According to self-efficacy theory, people develop domain-specific beliefs about their own abilities and characteristics that guide their behavior by determining what they try to achieve and how much effort they put into their performance in that particular situation or domain. (p. 488)

In a century-long cycle, social cognition-learning reformulations came to embrace not only J. M. Baldwin's concept of imitation but also his concept of the self as a central organizing theme.

Some characteristics of behaviorist models have remained virtually unchanged in the several generations of social learning theories. Social learning researchers have maintained a curious stance toward the concept of development. From Watson onward, learning theories have been developmental in the sense that they have shared the "fundamental point" that humans' activities should be studied historically. Social learning views have been slow to consider processes of age-related shifts in development (Cairns, 1979; Grusec, 1994). The implicit assumption has persisted that the incremental changes in cognition and learning are sufficient to account for the major phenomena of social development, including their establishment, maintenance, and change.

ATTACHMENT: DISCOVERY AND LOSS

With the rediscovery of imitation and modeling, students of social learning found fresh and robust phenomena to analyze, and a new generation of social learning models was born. So it was with mother-infant attachment. The systematic investigation of mother-infant attachment in studies of animal behavior, and subsequently in studies of humans, breathed new life into the psychoanalytic framework. According to an early definition by Ainsworth (1972), attachment refers to "an affectional tie or bond that one individual (person or animal) forms between himself and another specific individual" (p. 100).

The prototypic attachment is that which develops between mothers and infants. That a strong tie develops early in life is certainly no new revelation. However, the systematic study of attachment behavior in animals and humans began only in the post-World War II era. Scott (1962, 1963), and Harlow (1958) opened the door for the systematic study of this early affectional relationship with their now classic studies of the young puppy and infant rhesus monkey. At about the same time, Bowlby (1958) and his former postdoctoral associates (Ainsworth, 1963; Schaffer & Emerson, 1964) offered influential statements on attachment in human infants.

The Phenomena of Attachment

Harry F. Harlow (1958) announced in his American Psychological Association presidential address the results of some dramatic findings on the importance of somatosensory contact in the formation of the bond of the

infant monkey to inanimate "surrogate" mothers. According to the initial interpretation of these findings, tactile stimulation—or "contact comfort"—was a more powerful determinant than hunger in the infant's formation of a social attachment. Subsequent work by Harlow and others led to significant modifications in the initial interpretations—on the necessary and sufficient conditions for the development of mammalian attachments (e.g., Cairns, 1966), and on the stability and plasticity of effects induced by early social experience (e.g., Mason & Kinney, 1974; Suomi & Harlow, 1972). Nonetheless, the image of "motherless monkeys" had a catalytic effect in stimulating studies of mother-infant relations and, more generally, investigations of the development of social interactions.

Given the critical role assigned to early experiences in most developmental theories, it is curious that so little systematic work had been conducted on mother-infant attachment before the modern era. It is especially surprising because the intense relationship established between infants and mothers is perhaps the most easily detected and robust social phenomenon observed across mammals. At about the time when infants begin to locomote independently, they become extremely distressed when removed involuntarily or separated from their mothers (or mother-surrogates). Reunion tends to produce an immediate cessation of distress (e.g., the young quit crying, screaming, or bleating). Infants in this age range also express heightened weariness or fear when confronted with strange persons and strange places—or even familiar persons in strange places. These phenomena can be demonstrated in virtually all mammalian species; human babies show intermediate levels of intensity.

The multiple dimensions of early formed bonds were investigated in experimental and observational work with birds (i.e., imprinting) and mammals (i.e., attachment). By the mid-1960s, a comprehensive picture could be drawn of the conditions for the emergence and maintenance of and for change in attachment relationships (Harlow, 1958; Rosenblatt & Lehrman, 1963; Scott, 1963). The findings permitted four empirical generalizations about the nature of mammalian attachment (Cairns, 1966):

1. At birth and in the immediate postnatal period, there is an elegant synchrony between the actions and physiological states of the mother and of the infant. Moreover, the actions of the infant serve to maintain the mother in a maternal condition and sculpt her physiology so that it supports the contemporaneous needs of the infant. A parallel feedback loop serves similar functions for the infant, and a reciprocal relationship becomes established between the actions and states of the infant and those of the mother (Rosenblatt & Lehrman, 1963). Biological needs and social actions become mutually supportive (Hofer, 1994). In effect, the actions and biological conditions of the infant and mother rapidly become organized around each other.

2. Proximity and mutual mother-infant engagement promote the establishment of a social attachment that persists in the absence of the psychobiological conditions that originally promoted the interaction. In most mammalian species, the bond is intense, and involuntary separation triggers disorganization, distress, and disruption in both the infant and the mother. The distress is so extreme that it can be assessed by a host of behavioral and biological assessments.

3. Intense social attachment can be established under diverse conditions (e.g., the absence of milk, the absence of contact comfort, and, paradoxically, the presence of intense punishment). The influence of these conditions depends, in large measure, on the contexts of reciprocal exchange. Moreover, attachment can develop in older as well as younger animals (maternal attachment is but one of the special conditions). Experimental studies have indicated that social attachment strength increases with interaction, time spent, and exclusivity of relationship.

4. Maturational changes trigger modifications in the nature and the quality of attachment; maturation of the young is synchronized with maternal behavioral and physiological changes that are consistent with the mother's preparation for the next generation of offspring. New attachments are formed typically within minutes and hours rather than weeks and months, possibly to balance the tension between conservation and survival (Cairns & Werboff, 1967; Mason & Kinney, 1974). In this regard, the adaptation had to be rapid in order for the vulnerable infant to live.

Attachment Theory

Studies of infant-mother attachment came in the wake of these systematic investigations, and they stimulated enormous scientific and public interest (Maccoby & Masters, 1970). Psychoanalyst John Bowlby began a series of seminars on these issues at the Tavistock Clinic

in London in the 1950s, and expanded the series in the 1960s (Foss, 1961, 1965; see Bretherton & Waters, 1985). Two key research programs reported in these discussions were: (1) the observations of Schafer and Emerson (1964) on the age of onset of attachment and (2) Ainsworth's (1963) observational report of infant-mother attachment in Uganda. Schafer and Emerson (1964) discovered that human infants begin to exhibit discriminative attachment at about 8 to 9 lunar months after birth, and that these attachments were formed with respect to a wide range of persons who were intimately involved in the infants' caretaking.

John Bowlby first became known for his contributions to object relations theory and, specifically, the significance of early mother-infant bonds (i.e., Bowlby, 1946, 1952). Beginning in the early 1950s, he began informal interdisciplinary seminars that involved, along with others, the eminent ethologist Robert Hinde. One outcome of these discussions was a paper published in the *International Journal of Psychoanalysis* where Bowlby integrated concepts from object relations theory with evolutionary assumptions. He thereby generated a framework of attachment that fused psychoanalysis and ethology (Bowlby, 1958). In an important set of volumes, Bowlby described the implications of his "attachment theory" for understanding maternal-child anxiety, separation, and loss (1969, 1973).

In Bowlby's view of attachment, priority is given to the events that occur during the child's early years in the establishment of a relatively stable attachment system. Mother-infant separation is likely to produce enduring negative consequences. The nature of the attachment that is formed in early development gives rise to an internal representational model formed by the child. Moreover, the processes that give rise to an attachment involve intense mutual regulation and mutual organization between the mother and infant. Bowlby (1952) wrote:

> If growth is to proceed smoothly, the tissues must be exposed to the influence of the appropriate organizer at critical periods. In the same way, if mental development is to proceed smoothly, it would appear to be necessary for the undifferentiated psyche to be exposed during certain critical periods to the influence of the psychic organizer—the mother. (p. 53)

Unlike ethological/animal behavior work, Bowlby's object relations/attachment theory has a distinctive focus on individual differences. In addition, its goal, like object relations theory, is to provide a comprehensive account of psychopathology. Like ethological assumptions, it emphasizes the formative effects of early experiences.

Any discussion of modern "attachment theory" must include Mary D. S. Ainsworth, Bowlby's long-term collaborator. Ainsworth conducted a pair of influential observational studies on mother-infant relations in Uganda (Ainsworth, 1967) and Baltimore (Ainsworth, Blehar, Waters, & Wall, 1978). One of the procedures to emerge from the later study was a controlled observation procedure labeled the "Strange Situation" (Ainsworth et al., 1978).[7] This assessment involved a series of very brief separations (i.e., 1 to 3 minutes), with special attention given to the quality of the reunions. The coding of a reunion provided a classification procedure by which children were diagnosed as securely attached (Type B) or insecurely attached (Types A and C), along with various subtypes (Ainsworth et al., 1978). A primary attraction of attachment theory is its presumption that these types are linked to the quality of later relationships and to psychopathology.

An extended discussion of attachment theory and its strengths and shortcomings is beyond the limits of this chapter and would catapult the account into the contemporary period. For the current state of affairs on this enormously influential theory, the modern developmental version of neopsychoanalysis, see Bretherton and Waters (1985) and Goldberg, Muir, and Kerr (1995).

COGNITIVE REEMERGENCE

This era also saw the reemergence of cognitive-developmental questions as a central focus for thinking and research. Stimulated by a national reexamination of the educational process (e.g., Bruner, 1960), in part because of influential volumes on Piaget (Flavell, 1963; Hunt, 1961) and Vygotsky (Cole, 1978), and in part because of the fading vigor of social learning approaches, the problem of how mental development occurs became a dominant concern for developmental researchers. It is a reemergence—rather than a revolution—because the issues of mind, consciousness, and mental development were central to the discipline at its founding.

Virtually all aspects of the field were touched by the fresh emphasis. Investigations of language development,

[7] The "Strange Situation" seems to have been modeled after the assessments of attachment employed with nonhuman mammals (see Scott, 1963).

thinking, sensation, and information processing in children flourished as they had in no earlier era. Even hard-core behavioristic models proved to be vulnerable to cognitive modifications, with the new directions on "mediational mechanisms" being provided by T. and H. Kendler (Kendler & Kendler, 1962) and M. Kuenne (1946). Information-processing approaches were challenged to build bridges to cognitive developmental studies and interpretations. Given the thrust of the movement, it seemed inevitable that the barriers between social development and cognitive development should be transcended, and that it should become once again permissible to refer to concepts of others and of self (see Harter, 1983, 1998, Chapter 9, this *Handbook,* Volume 3; Lewis & Brooks-Gunn, 1979). The recent history of this movement and the statement of the rapprochement among experimental-cognitive concepts, social cognition, and cognitive-developmental concepts are covered in other chapters of this *Handbook* (e.g., see, Baltes, Lindenberger, & Staudinger, Chapter 11, this *Handbook,* this volume; Fischer & Bidell, 1998; Kuhn & Franklin, Chapter 22, this *Handbook,* Volume 2; Overton, Chapter 2, this *Handbook,* this volume).

HISTORICAL THEMES AND CONTEMPORARY ADVANCES

Now, more than 100 years after it began, developmental research and theory continue to be diverse, vigorous, contentious, fresh, and in many instances, brilliant. In concluding this chapter, we recall the themes that were identified in the beginning, to both take stock of the last 2 decades of developmental science and to describe the progress made and the pitfalls encountered in more than a century of scientific work (see also Cairns, 2000; Cairns, Cairns, Rodkin, & Xie, 1998).

Knowledge and Consciousness

Understanding the mind and how it develops and functions remains a major concern for developmentalists. Because of advances in technology, investigators who study the relations between brain processes and cognitive activity have achieved spectacular advances in identifying pathways and plasticity over time. And there is now compelling evidence to support Preyer's speculation that "the brain grows through its own activity." Yet, plenty of controversies remain, and certain basic issues continue to be controversial (e.g., is there an area in the brain devoted to language?) despite impressive advances in understanding and methodology. At least some of the matters that remain unresolved have less to do with how the brain is studied than with how our constructs of the mind are formulated and our measures are organized (Morrison & Ornstein, 1996; see Gottlieb et al., Chapter 5; Magnusson & Stattin, Chapter 8; Overton, Chapter 2; Valsiner, Chapter 4, this *Handbook,* this volume).

Thoughts and Actions

The self and its distinctive processes (e.g., self-concepts, self-efficacy, self-regulation) continue to be central for modern researchers. What was attributed to the "will" in the 1890s is attributed to the self and its processes (motives, values, dispositions) in the 1990s. What has changed, however, are methods, measures, and the findings that they yield. The multilevel, multimeasure methodological procedures of the late twentieth century have exposed some myths. One's own self-attributions are not necessarily the same as descriptions of the self by others, and the differences are systematically linked to the domains assessed, the contexts of assessment, and the meaning of the measures. The story of how the discrepancies between the self and others is now being addressed belongs, however, to today, not to the past. The current state of information on these matters is addressed elsewhere in this volume (see Baltes et al., Chapter 11; Brandstädter, Chapter 10; Rathunde & Csikszentmihalyi, Chapter 9, this *Handbook,* this volume).

Ontogeny and Phylogeny

How may development be best defined: in terms of the ontogeny of individuals, the ontogeny of the species, or the ontogeny of both? This was one of the first issues in the systematic development of the science, and it has been one of the last to be reassessed in the present era. But it is now being addressed as a matter of how cross-generational transfer occurs, and how there may be turning points across generations as well as across ontogeny. According to a recent collaborative statement, "Developmental investigation focuses attention to the ontogenies of both embryos and ancestors, and to the process by which pathways may be repeated or redirected across successive generations" (Carolina Consortium on Human Development, 1996, p. 1). Intergenerational investigations may become a primary

methodology of the future as they become feasible and practical (see, e.g., Bronfenbrenner & Morris, Chapter 14, this *Handbook,* this volume; Cairns, Cairns, Xie, Leung, & Hearne, 1998; Elder & Shanahan, Chapter 12, this *Handbook,* this volume).

Nature and Nurture

After a century of controversy, the nature-nurture debate was still being contested both in public and in the laboratory (e.g., Herrnstein & Murray, 1994; Lehrman, 1953, 1970). Recall that J. M. Baldwin resolved the matter by observing that "most of man's equipment is due to both causes working together," and Preyer arrived at the same conclusion.

Today, the split conceptions of nature and nurture, and of the reductionist formulations associated with either a nature (e.g., sociobiology or behavior genetics) or a nurture (e.g., Behaviorism or functional analysis approaches) have passed from the main stream of theoretical and scientific interest (e.g., see Gottlieb, et al., Chapter 5; Overton, Chapter 2, this *Handbook,* this volume) and—through the lens of various versions of developmental systems theories (e.g., see Fischer & Bidell, 1998; Lerner, Chapter 1; Magnusson & Stattin, Chapter 8; Thelen & Smith, Chapter 6, this *Handbook,* this volume)—scientific attention has focused on models and methods that now promise to begin to address the question of how "both causes work together" at the level of biology, interactions, and social networks.

When Does Development End?

Virtually all researchers in this discipline are developmentalists—including arch-maturationist Arnold Gesell. The naïve idea of strict preformism and unidirectional causation has been a straw man since the beginning of the science. But there remain radical differences among investigators in *when* they believe experiences to be extremely relevant, and when they consider them to be irrelevant. Early speculations on this issue were handicapped by a paucity of systematic normative and experimental information. In the absence of longitudinal information on the behavioral adaptations of human beings, there was no adequate basis for selecting or rejecting these theoretical assumptions about the timing and functions of early experience. Neurobehavioral, cognitive, and social developmental research in the modern era has begun to clarify the role of time and timing across several domains. This information is reviewed, for example, by Baltes et al. (Chapter 11, this *Handbook,* this volume), Brandstädter (Chapter 10, this *Handbook,* this volume), Elder and Shanahan (Chapter 12, this *Handbook,* this volume), Overton (Chapter 2, this *Handbook,* this volume), and Valsiner (Chapter 4, this *Handbook,* this volume).

Morality and the Perfectibility of Humans

Values and moral development continue to be important for the discipline, although the work has been handicapped by serious methodological challenges. With a few important exceptions, the conceptual framework for understanding the development of personal values was given less attention than in the earlier eras. The importance of this domain has emerged in the past 20 years, as instantiated by interest in moral and spiritual development (see Oser, Scarlett, & Bucher, Chapter 17, this *Handbook,* this volume), positive youth development (see Benson, Scales, Hamilton, & Sesma, Chapter 16, this *Handbook,* this volume), and the use of strength-based models of human development to conceptualize and study the development of diverse children and adolescents (see Spencer, Chapter 15, this *Handbook,* this volume).

Given this burgeoning theoretical and empirical work, it seems likely that this domain will come to the forefront in the next era. Indeed, the current concern with the self and with self-organization in the social context prepares the way for an integrated view of morality, positive human development, and the capacities for healthy functioning present in all people. As Kohlberg insightfully observed, "An individual is fundamentally a potentially moral being, not because of social authority and rules (as Durkheim and Piaget thought) but because his ends, his will, his self is that of a shared social self" (Kohlberg, 1982, pp. 311–312).

Social Applications

Applications continue to present large opportunities and large problems. Sears (1975) concluded that the discipline was created to be relevant. In this regard, White (1996) wrote:

> Child study of some sort has to be part and parcel of any social design for children. Though developmental psychology is not, in the traditional sense, a policy science it has nevertheless a significant role to play in the organization

> and management of systems of governance directed toward children and families. (p. 413)

As research has become increasingly more tied to specific social concerns and social needs, some have feared that the science would be compromised. That has not occurred. To the contrary, carefully evaluated social applications have helped create a more robust, verifiable, and relevant science (Lerner, Chapter 1, this *Handbook,* this volume). Indeed the burgeoning of interest in applied developmental science that has occurred in the past 20 years and, certainly, since the last edition of this *Handbook* (e.g., see Farmer & Farmer, 2001; Fisher & Lerner, 2005; Gest, Mahoney, & Cairns, 1999; Lerner, Jacobs, & Wertlieb, 2003; and the several volumes of the journals, *Applied Developmental Science* and the *Journal of Applied Developmental Psychology*) has derived at least in part from the use of developmental systems theories to discuss the plasticity of human development and thus the potential of applying developmental science to promote positive human development.

One other by-product of social applications should be mentioned. The rapid growth of the discipline has created some unanticipated hazards for developmental study, not the least of which is the intense competition for publication space and research support. In one unfortunate outcome, closely knit research groups have formed tight theoretical and/or empirical coalitions that promote inclusion and practice exclusion. Under these conditions, dominant methodologies and ideas tend to monopolize resources while ignoring or distorting competing concepts and disconfirming evidence. Although these efforts tend to self-correct in the long term, they may create fragmentation and misunderstanding in the short term. In this regard, efforts to achieve effective applications often act as catalysts to bring ideas and findings to common ground and common standards.

TOWARD AN INTERDISCIPLINARY SCIENCE

In June 1994, a Nobel Foundation symposium comprised of noted biologists and psychologists called for an integrated, unified framework for the study of development (Magnusson, 1996). No single source or single investigator can be credited, since it has become an interdisciplinary, international movement. In the history of the discipline, this is a singular event. Over the past 100 plus years, the insights and emphases of developmental investigators in Europe—from Binet and Stern to Lewin and Bühler—have often been on a different frequency than those in North America, and the reverse held as well. When exceptions occurred—early, with Baldwin, Piaget, Vygotsky, and Freud; and later, with Magnusson, Bronfenbrenner, Bandura, Bruner, and Bowlby—the entire discipline was revitalized.

The contemporary press toward better integrated models of development arose from multiple sources. These include social development and social ecology (e.g., Bronfenbrenner, 1995, 2005; Ford & Lerner, 1992), developmental psychobiology and ethology (P. P. G. Bateson, 1991; Garcia Coll, Bearer, & Lerner, 2004; Gottlieb, 1992; Hinde, 1970; Hood, Greenberg, & Tobach, 1995), the dynamic systems approach (Lerner, 2002; Smith & Thelen, 1993; Thelen & Smith, 1994), developmental psychopathology (e.g., Cicchetti & Cohen, 1995; Hay & Angold, 1993), cognitive development (Baltes & Baltes, 1990; van der Veer & Valsiner, 1991), and developmental science (Carolina Consortium on Human Development, 1996; Magnusson, 1996). Due in part to methodological advances in the study of development, basic perceptual and movement patterns gained fresh life and new direction. It appears that studies of social development, emotion, and cognition may be the greatest beneficiaries of the current drive toward a more integrated developmental framework.

Given the advances in theory—advances which were not possible until empirical data became available to sort out the developmental concepts—the field now seems on the threshold of becoming a true interdisciplinary science. The longitudinal studies initiated in the 1960s and 1970s in Stockholm by David Magnusson, in Finland by Lea Pulkinnen, and in England by Michael Rutter and David Farrington provided models for United States researchers across the last decades of the twentieth century. Longitudinal research on children and adolescents has triggered a new revolution in methodology (e.g., see Duncan, Magnuson, & Ludwig, 2004; Laub & Sampson, 2004; McArdle & Nesselroade, 2003; Mishler, 2004; Molenaar, 2004; Nesselroade & Ram, 2004; Skrondal & Rabe-Hesketh, 2004; von Eye, 1990; von Eye & Bergman, 2003; von Eye & Gutiérrez Peña, 2004; Willett, 2004). Important findings have been generated (e.g., Phelps, Furstenberg, & Colby, 2002; C. H. Young, Savola, & Phelps, 1991). This work has helped the field regain the vitality enjoyed in early eras. The multilevel information is now being organized around individuals in the natural contexts of their lives. When wedded to

concerns of origins and plasticity, this information becomes "the essence of developmental theory" (Yarrow et al., 1968).

REFERENCES

Ainsworth, M. D. S. (1963). The development of infant-mother interaction among the Ganda. In B. M. Foss (Ed.), *Determinants of infant behavior* (Vol. 2, pp. 67–104). New York: Wiley.

Ainsworth, M. D. S. (1967). *Infancy in Uganda: Infant care and the growth of love.* Baltimore: Johns Hopkins University Press.

Ainsworth, M. D. S. (1972). Attachment and dependency: A comparison. In J. L. Gewirtz (Ed.), *Attachment and dependency* (pp. 97–137). New York: Wiley.

Ainsworth, M. D. S., Blehar, M. C., Waters, E., & Wall, S. (1978). *Patterns of attachment: A psychological study of the Strange Situation.* Hillsdale, NJ: Erlbaum.

Allport, G. W. (1937). *Personality: A psychological interpretation.* New York: Holt.

Anderson, J. E. (1931). The methods of child psychology. In C. Murchison (Ed.), *A handbook of child psychology* (pp. 1–27). Worcester, MA: Clark University Press.

Anderson, J. E. (1939). The limitations of infant and preschool test in the measurement of intelligence. *Journal of Psychology, 8,* 351–379.

Arrington, R. E. (1932). *Interrelations in the behavior of young children* (Child Development Monographs No. 8). New York: Columbia University Press, Teachers College.

Bach, G. R. (1946). Father fantasies and father-typing in father-separated children. *Child Development, 17,* 63–80.

Baldwin, A. (1980). *Theories of child development.* New York: Wiley. (Original work published 1967)

Baldwin, B. T., & Stecher, L. I. (1924). *The psychology of the preschool child.* New York: Appleton.

Baldwin, J. M. (1890). Origin of right- or left-handedness. *Science, 16,* 302–303.

Baldwin, J. M. (1891). Suggestion in infancy. *Science, 17,* 113–117.

Baldwin, J. M. (1892). Infants' movements. *Science, 19,* 15–16.

Baldwin, J. M. (1893). Distance and color perception by infants. *Science, 21,* 231–232.

Baldwin, J. M. (1895). *Mental development in the child and the race: Methods and processes.* New York: Macmillan.

Baldwin, J. M. (1902). *Development and evolution.* New York: Macmillan.

Baldwin, J. M. (1906). *Social and ethical interpretations in mental development: A study in social psychology.* New York: Macmillan. (Original work published 1897)

Baldwin, J. M. (1915). *Genetic theory of reality, being the outcome of genetic logic, as issuing in the aesthetic theory of reality called pancalism.* New York: Putnam.

Baldwin, J. M. (1930). [Autobiography]. *A History of Psychology in Autobiography, 1,* 1–30.

Bandura, A. (1969). *Principles of behavior modification.* New York: Holt, Rinehart and Winston.

Bandura, A., & Walters, R. H. (1959). *Adolescent aggression.* New York: Ronald Press.

Bandura, A., & Walters, R. H. (1963). *Social learning and personality development.* New York: Holt, Rinehart and Winston.

Barker, M. (1930). *A technique for studying the social-material activities of young children* (Child Development Monographs No. 3). New York: Columbia University Press.

Barker, R. G. (Ed.). (1963). *The stream of behavior: Explorations of its structure and content.* New York: Appleton-Century-Crofts.

Barker, R. G. (1964). *Big school, small school: High school size and student behavior.* Stanford, CA: Stanford University Press.

Barker, R. G. (1968). *Ecological psychology: Concepts and methods for studying the environment of human behavior.* Stanford, CA: Stanford University Press.

Barker, R. G., Dembo, T., & Lewin, K. (1941). Frustration and regression: An experiment with young children. *University of Iowa Studies in Child Welfare, 18*(1).

Barnes, E. (1896–1897, 1902–1903). *Studies in education* (Vols. 1–2). Philadelphia: Author.

Bateson, G., Jackson, D. D., Hayley, J., & Weakland, J. H. (1956). Toward a theory of schizophrenia. *Behavioral Science, 1,* 251–264.

Bateson, P. P. G. (Ed.). (1991). *The development and integration of behavior: Essays in honor of Robert Hinde.* New York: Cambridge University Press.

Bayley, N. (1932). A study of crying of infants during mental and physical tests. *Journal of Genetic Psychology, 40,* 306–329.

Beaver, A. P. (1930). *The initiation of social contacts by preschool children* (Child Development Monographs No. 7). New York: Columbia University Press.

Bell, R. Q. (1968). A reinterpretation of the direction of effects in studies of socialization. *Psychological Review, 75,* 81–95.

Bell, R. Q., & Harper, L. V. (1977). *Child effects on adults.* Hillsdale, NJ: Erlbaum.

Bergenn, V. W., Dalton, T. C., & Lipsitt, L. P. (1994). Myrtle B. McGraw: A growth scientist. In R. D. Parke, P. A. Ornstein, J. J. Rieser, & C. Zahn-Waxler (Eds.), *A century of developmental psychology* (pp. 389–423). Washington, DC: American Psychological Association.

Bijou, S. W., & Baer, D. M. (1961). *Child development.* New York: Appleton-Century-Crofts.

Binet, A. (1887). Le Fétichisme dans l'amour. *Revue Philosophique, 24,* 143–167, 252–274.

Binet, A. (1892). *Les Altérations de la personnalité* (Trans. 1896). Paris: Félix Alcan.

Binet, A. (1903). *L'étude experimentale de l'intelligence.* Paris: Schleicher.

Binet, A. (1908). Le développement de l'intelligence chez enfants. *L'Année Psychologique, 14,* 1–94.

Binet, A. (1911). Nouvelles recherches sur la measure du niveau intellectuel chez les enfants d'ecole. *L'Année Psychologique, 17,* 145–201.

Binet, A. (1973). Nos commission de travail. In T. H. Wolfe (Ed.), *Alfred Binet.* Chicago: University of Chicago Press. (Original work published 1904)

Binet, A. (1978). *Les idées modernes sur les enfants.* Paris: Flammnarion. (Original work published 1909)

Binet, A., & Henri, V. (1894). La mémoire des phrases (mémoire des idées). *L'Année Psychologique, 1,* 24–59.

Binet, A., & Henri, V. (1895). La psychologie individuelle. *L'Année Psychologique, 2,* 411–465.

Binet, A., Phillippe, J., Courtier, J., & Henri, V. (1894). *Introduction à la psychologie expérimentale*. Paris: Alcan.

Binet, A., & Simon, T. (1905). Méthods nouvelles pour le diagnostic du niveau intellectuel des anormaux. *L'Année Psychologique, 11,* 191–244.

Birns, B. (1984). Piaget and Wallon: Two giants of unequal visibility. In G. Voyat (Ed.), *The world of Henri Wallon* (pp. 59–65). New York: Aronson.

Boring, E. G. (1950). *A history of experimental psychology.* New York: Century. (Original work published 1929)

Borstlemann, L. J. (1983). Children before psychology: Ideas about children from antiquity to the late 1800s. In P. H. Mussen (Series Ed.) & W. Kessen (Vol. Ed.), *Handbook of child psychology* (4th ed., pp. 1–80). New York: Wiley.

Bott, H.(1934). *Personality development in young children.* Toronto, Ontario, Canada: University of Toronto Press.

Bowlby, J. (1946). *Forty-four juvenile thieves: Their characters and home backgrounds.* London: Bailliere, Tindall, & Cox.

Bowlby, J. (1952). *Maternal care and mental health* (2nd ed.). Geneva, Switzerland: World Health Organization.

Bowlby, J. (1958). The nature of the child's tie to his mother. *International Journal of Psycho-Analysis, 39,* 350–373.

Bowlby, J. (1969). *Attachment and loss: Vol. 1. Attachment.* New York: Basic Books.

Bowlby, J. (1973). *Attachment and loss: Vol. 2. Separation: Anxiety and anger.* New York: Basic Books.

Bretherton, I., & Waters, E. (1985). *Growing points of attachment: Theory and research.* Chicago: University of Chicago Press.

Breuer, J., & Freud, S. (1936). *Studies in hysteria* (A. A. Brill, Trans.). New York: Nervous and Mental Disease. (Original work published 1895)

Bronfenbrenner, U. (1979). *The ecology of human development: Experiments by nature and design.* Cambridge, MA: Harvard University Press.

Bronfenbrenner, U. (1993). The ecology of cognitive development: Research models and fugitive findings. In R. H. Wozniak & K. W. Fischer (Eds.), *Development in context: Acting and thinking in specific environments* (pp. 3–44). Hillsdale, NJ: Erlbaum.

Bronfenbrenner, U. (1995). Developmental ecology through space and time: A future perspective. In P. Moen, G. H. Elder Jr., & K. Lüscher (Eds.), *Examining lives in context: Perspectives on the ecology of human development* (pp. 619–647). Washington, DC: American Psychological Association.

Bronfenbrenner, U. (2005). *Making human beings human.* Thousand Oaks, CA: Sage.

Broughton, J. M. (1981). The genetic psychology of James Mark Baldwin. *American Psychologist, 36,* 396–407.

Broughton, J. M., & Freeman-Moir, D. J. (1982). *The cognitive developmental psychology of James Mark Baldwin: Current theory and research in genetic epistemology.* Norwood, NJ: Ablex.

Bruner, J. (1960). *The process of education.* Cambridge, MA: Harvard University Press.

Buckley, K. W. (1989). *Mechanical man: John Broadus Watson and the beginnings of behaviorism.* New York: Guilford Press.

Bühler, C. (1931). The social behavior of the child. In C. Murchison (Ed.), *A handbook of child psychology* (pp. 374–416). Worcester, MA: Clark University Press.

Bühler, K. (1930). *The mental development of the child: A summary of modern psychology theory.* New York: Harcourt Brace.

Burt, C. (1920–1921). A young girl's diary. *British Journal of Psychology: Medical Section, 1,* 353–357.

Cahan, E. D. (1984). The genetic psychologies of James Mark Baldwin and Jean Piaget. *Developmental Psychology, 20,* 128–135.

Cahan, E. D. (1994). John Dewey and human development. In R. D. Parke, P. A. Ornstein, J. J. Rieser, & C. Zahn-Waxler (Eds.), *A century of developmental psychology* (pp. 145–167). Washington, DC: American Psychological Association.

Cahan, E. D., & White, S. H. (1992). Proposals for a second psychology. *American Psychologist, 47,* 224–235.

Cairns, R. B. (1966). Attachment behavior of mammals. *Psychological Review, 73,* 409–426.

Cairns, R. B. (1976). The ontogeny and phylogeny of social behavior. In M. E. Hahn & E. C. Simmel (Eds.), *Evolution and communicative behavior* (pp. 115–139). New York: Academic Press.

Cairns, R. B. (1979). *Social development: The origins and plasticity of social interchanges.* San Francisco: Freeman.

Cairns, R. B. (1983). The emergence of developmental psychology. In P. H. Mussen (Series Ed.) & W. Kessen (Vol. Ed.), *Handbook of child psychology: Vol. 1. History, theory, and methods* (4th ed., pp. 41–102). New York: Wiley.

Cairns, R. B. (1986). Phenomena lost: Issues in the study of development. In J. Valsiner (Ed.), *The individual subject and scientific psychology* (pp. 97–112). New York: Plenum Press.

Cairns, R. B. (1992). The making of a developmental science: The contributions and intellectual heritage of James Mark Baldwin. *Developmental Psychology, 28,* 17–24.

Cairns, R. B. (2000). Developmental Science: Three audacious implications. In L. R. Bergman & R. B. Cairns (Eds.), *Developmental science and the holistic approach* (pp. 49–62). Mahwah, NJ: Erlbaum.

Cairns, R. B., Cairns, B. D., Rodkin, P., & Xie, H. (1998). New directions in developmental research: Models and methods. In R. Jessor (Ed.), *New perspectives on adolescent risk behavior* (pp. 13–40). New York: Cambridge University Press.

Cairns, R. B., Cairns, B. D., Xie, H., Leung, M.-C., & Hearne, S. (1998). Paths across generations: Academic competence and aggressive behaviors in young mothers and their children. *Developmental Psychology, 34,* 1162–1174.

Cairns, R. B., & Ornstein, P. A. (1979). Developmental psychology. In E. S. Hearst (Ed.), *The first century of experimental psychology* (pp. 459–510). Hillsdale, NJ: Erlbaum.

Cairns, R. B., & Werboff, J. (1967). Behavior development in the dog: An interspecific analysis. *Science, 158,* 1070–1072.

Carmichael, L. (1933). Origin and prenatal growth of behavior. In C. Murchison (Ed.), *A handbook of child psychology* (2nd ed., pp. 31–159). Worcester, MA: Clark University Press.

Carmichael, L. (Ed.). (1946). *Manual of child psychology.* New York: Wiley.

Carolina Consortium on Human Development. (1996). A collaborative statement. In R. B. Cairns, G. H. Elder, & E. J. Costello (Eds.), *Developmental science* (pp. 1–7). New York: Cambridge University Press.

Carpenter, W. B. (1854). *Principles of comparative physiology* (4th ed.). Philadelphia: Blanchard and Lea.

Carroll, J. B., & Horn, J. L. (1981). On the scientific basis of ability testing. *American Psychologist, 36,* 1012–1020.

Cattell, J. (1890). Mental tests and measurements. *Mind, 15,* 373–381.

Challman, R. C. (1932). Factors influencing friendships among preschool children. *Child Development, 3,* 146–158.

Charlesworth, W. R. (1992). Charles Darwin and developmental psychology: Past and present. *Developmental Psychology, 28,* 5–16.

Cicchetti, D., & Cohen, D. J. (Eds.). (1995). *Developmental psychopathology.* New York: Wiley.

Cole, M. (Ed.). (1978). *Mind in society: The development of higher psychological processes.* Cambridge, MA: Harvard University Press.

Compayré, G. (1893). *L'évolution intellectuelle et morale de l'enfant.* Paris: Hachette.

Cooley, C. H. (1902). *Human nature and the social order.* New York: Free Press.

Costall, A. (1993). How Lloyd Morgan's canon backfired. *Journal of the History of the Behavioral Sciences, 29,* 113–122.

Cottrell, L. S., Jr. (1942). The analysis of situational fields in social psychology. *American Sociological Review, 7,* 370–382.

Cottrell, L. S., Jr. (1969). Interpersonal interaction and the development of the self. In D. A. Goslin (Ed.), *Handbook of socialization theory and research* (pp. 543–579). Chicago: Rand McNally.

Cremin, L. A. (1964). *The transformation of the school: Progressivism in American education, 1876–1957.* New York: Vintage Books.

Cronbach, L. J. (1957). The two disciplines of scientific psychology. *American Psychologist, 12,* 671–784.

Dahlstrom, W. G. (1985). The development of psychological testing. In G. A. Kimble & K. Schlesinger (Eds.), *Topics in the history of psychology* (Vol. 2, pp. 63–113). New York: Wiley.

Darwin, C. (1877). Biographical sketch of an infant. *Mind, 2,* 285–294.

de Beer, G. (1958). *Embryos and ancestors* (3rd ed.). London: Oxford University Press.

Dewey, J. (1899). *The school and society.* Chicago: University of Chicago Press.

Dewey, J. (1916). *Democracy and education: An introduction to the philosophy of education.* New York: Macmillan.

Dollard, J., Miller, N. E., Doob, L. W., Mowrer, O. H., & Sears, R. R. (1939). *Frustration and aggression.* New Haven, CT: Yale University Press.

Drachman, D. B., & Coulombre, A. J. (1962). Experimental clubfoot and arthrogryposis multiplex congenita. *Lancet, 283,* 523–526.

Drummond, W. B. (1907). *An introduction to child study.* London: Arnold.

Duncan, G. J., Magnusson, K. A., & Ludwig, J. (2004). The endogeneity problem in developmental studies. *Research in Human Development, 1*(1/2), 59–80.

Ebbinghaus, H. (1897). Über eine neue Methode zur Prüfung geistiger Fähigkeiten und ihre Anwedung bei Schulkindern. *Zeitschrift für angewandte psychologie, 13,* 401–459.

Elder, G. H., Jr., Modell, J., & Parke, R. D. (Eds.). (1993). *Children in time and place: Developmental and historical insights.* New York: Cambridge University Press.

Estes, W. K. (1944). *An experimental study of punishment* (Psychological Monographs, 57, 3). Evanston, IL: American Psychological Association.

Estes, W. K. (1954). Kurt Lewin. In W. Estes, S. Koch, K. MacCorquodale, P. Meehl, C. Mueller Jr., W. Schoenfeld, et al. (Eds.), *Modern learning theory* (pp. 317–344). New York: Appleton-Century-Crofts.

Farmer, T. W., & Farmer, E. M. Z. (2001). Developmental science, systems of care, and prevention of emotional and behavioral problems in youth. *American Journal of Orthopsychiatry, 71,* 171–181.

Fenichel, O. (1945). *The psychoanalytic theory of neurosis.* New York: Norton.

Féré, C. (1888). Note sur les modifications de la résistance électrique sous l'influence des excitations sensorielles et des émotions. *Comptes Rendus de la Société de Biologie, 40,* 217–219.

Fischer, K. W., & Bidell, T. R. (1998). Dynamic development of psychological structures in action and thought. In W. Damon (Editor-in-Chief) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 467–561). New York: Wiley.

Fisher, C. B., & Lerner, R. M. (2005). *Encyclopedia of applied developmental science.* Thousand Oaks, CA: Sage.

Fiske, J. (1883). *Excursions of an evolutionist.* Boston: Houghton Mifflin.

Flavell, J. H. (1963). *The developmental psychology of Jean Piaget.* Princeton, NJ: Van Nostrand.

Ford, D. H., & Lerner, R. M. (1992). *Developmental systems theory: An integrative approach.* Newbury Park, CA: Sage.

Foss, B. M. (Ed.). (1961). *Determinants of infant behavior.* New York: Wiley.

Foss, B. M. (Ed.). (1965). *Determinants of infant behavior: II.* New York: Wiley.

Frank, L. (1935). The problem of child development. *Child Development, 6,* 7–18.

Franz, S. I. (1898). [Review of the book *L'Année Psychologique,* Vol. 4]. *Psychological Review, 5,* 665.

Freud, A. (1931). Psychoanalysis of the child. In C. Murchison (Ed.), *A hand-book of child psychology* (pp. 555–567). Worcester, MA: Clark University Press.

Freud, S. (1910). The origin and development of psychoanalysis. *American Journal of Psychology, 21,* 181–218.

Freud, S. (1939). *Moses and monotheism.* New York: Random House.

Freud, S. (1957). *A general selection from the works of Sigmund Freud.* New York: Liveright.

Freud, S. (1973). Psychoanalysis: Fundamentals. In *Encyclopedia Britannica* (Vol. 18). Chicago: Encyclopedia Britannica. (Original work published 1926)

Galton, F. (1871). *Hereditary genius: An inquiry into its laws and consequences.* New York: Appleton.

Galton, F. (1883). *Inquiries into human faculty and its development.* London: Macmillan.

Garcia Coll, C., Bearer, E., & Lerner, R. M. (Eds.). (2004). *Nature and nurture: The complex interplay of genetic and environmental influences on human behavior and development.* Mahwah, NJ: Erlbaum.

Garvey, C., & Hogan, R. (1973). Social speech and social interaction: Egocentrism revisited. *Child Development, 44,* 562–568.

Gesell, A. (1928). *Infancy and human growth.* New York: Macmillan.

Gesell, A. (1931). The developmental psychology of twins. In C. Murchison (Ed.), *A handbook of child psychology* (pp. 209–235). Worcester, MA: Clark University Press.

Gesell, A. (1933). Maturation and the patterning of behavior. In C. Murchison (Ed.), *A handbook of child psychology* (2nd ed., pp. 158–203). Worcester, MA: Clark University Press.

Gesell, A., & Amatruda, C. S. (1941). *Developmental diagnosis: Normal and abnormal child development.* New York: Hoeber.

Gesell, A., & Thompson, H. (1934). *Infant behavior: Its genesis and growth.* New York: McGraw-Hill.

Gesell, A., & Thompson, H. (1938). *The psychology of early growth.* New York: Macmillan.

Gest, S. D., Mahoney, J. L., & Cairns, R. B. (1999). A developmental approach to prevention research: Configural antecedents of early parenthood. *American Journal of Community Psychology, 27,* 543–565.

Gewirtz, J. L. (1961). A learning analysis of the effects of normal stimulation, privation, and deprivation on the acquisition of social motivation and attachment. In B. M. Foss (Ed.), *Determinants of infant behavior.* New York: Wiley.

Gewirtz, J. L., & Baer, D. (1958). The effect of brief social deprivation on behaviors for a social reinforcer. *Journal of Abnormal and Social Psychology, 56,* 49–56.

Gilbert, J. A. (1894). Researches on the mental and physical development of school children. *Studies of the Yale Psychology Laboratories, 2,* 40–100.

Gilbert, J. A. (1897). Researches upon school children and college students. *University of Iowa Studies: Studies in Psychology, 1,* 1–39.

Goddard, H. H. (1911). Two thousand normal children measured by the Binet measuring scale of intelligence. *Pedagogical Seminary, 18,* 232–259.

Goldberg, S., Muir, R., & Kerr, J. (Eds.). (1995). *Attachment theory: Social, developmental, and clinical perspectives.* Hillsdale, NJ: Analytic Press.

Goodenough, F. L. (1929). The emotional behavior of young children during mental tests. *Journal of Juvenile Research, 13,* 204–219.

Goodenough, F. L. (1930a). Interrelationships in the behavior of young children. *Child Development, 1,* 29–47.

Goodenough, F. L. (1930b). Work of child development research centers: A survey. *Child Study, 4,* 292–302.

Goodenough, F. L. (1931). *Anger in young children.* Minneapolis: University of Minnesota Press.

Goodenough, F. L. (1954). The measurement of mental growth in childhood. In L. Carmichael (Ed.), *Manual of child psychology* (2nd ed., pp. 459–491). New York: Wiley.

Goodwin, C. J. (1987). In Hall's shadow: Edmund Clark Sanford, 1859–1924. *Journal of the History of the Behavioral Sciences, 23,* 153–168.

Gottlieb, G. (1973). Dedication to W. Preyer, 1841–1897. In G. Gottlieb (Ed.), *Behavioral embryology* (pp. xv–xix). New York: Academic Press.

Gottlieb, G. (1976). The roles of experience in the development of behavior and the nervous system. In G. Gottlieb (Ed.), *Neural and behavioral specificity* (pp. 3–48). New York: Academic Press.

Gottlieb, G. (1979). Comparative psychology and ethology. In E. Hearst (Ed.), *The first century of experimental psychology* (pp. 147–173). Hillsdale, NJ: Erlbaum.

Gottlieb, G. (1987). The developmental basis for evolutionary change. *Journal of Comparative Psychology, 101,* 262–272.

Gottlieb, G. (1992). *Individual development and evolution: The genesis of novel behavior.* New York: Oxford University Press.

Gould, S. J. (1977). *Ontogeny and phylogeny.* Cambridge, MA: Harvard University Press.

Grusec, J. E. (1994). Social learning theory and developmental psychology: The legacies of Robert R. Sears and Albert Bandura. In R. D. Parke, P. A. Ornstein, J. J. Rieser, & C. Zahn-Waxler (Eds.), *A century of developmental psychology* (pp. 473–497). Washington, DC: American Psychological Association.

Guthrie, E. R. (1935). *The psychology of learning.* New York: Harper.

Haeckel, E. (1866). *Generelle Morphologie der Organismen* (Vols. 1–2). Berlin, Germany: Georg Reimer.

Haeckel, E. (1901). *The riddle of the universe at the close of the nineteenth century.* London: Watts.

Hall, G. S. (1883). The contents of children's minds. *Princeton Review, 2,* 249–272.

Hall, G. S. (1885). The new psychology. *Andover Review, 3,* 120–135, 239–248.

Hall, G. S. (1888–1889). Foreword. In W. Preyer (Ed.), *The mind of the child* (Vol. 1). New York: Appleton.

Hall, G. S. (1891). The contents of children's minds on entering school. *Pedagogical Seminary, 1,* 139–173.

Hall, G. S. (1904). *Adolescence: Its psychology and its relations to physiology, anthropology, sociology, sex, crime, religion, and education* (Vols. 1–2). New York: Appleton.

Hall, G. S. (1922). *Senescence, the last half of life.* New York: Appleton.

Hall, G. S., & Lindzey, G. (1957). *Theories of personality.* New York: Wiley.

Hamburger, V. (1970). Von Baer: Man of many talents. *Quarterly Review of Biology, 45,* 173–176.

Harlow, H. F. (1958). The nature of love. *American Psychologist, 13,* 673–685.

Harter, S. (1983). Developmental perspectives on the self-system. In P. H. Mussen (Series Ed.) & M. Hetherington (Vol. Ed.), *Handbook of child psychology* (4th ed., Vol. 4, pp. 275–386). New York: Wiley.

Harter, S. (1998). The development of self-representations. In W. Damon (Editor-in-Chief) & N. Eisenberg (Vol. Ed.) *Handbook of child psychology: Vol. 3. Social, emotional, and personality development* (5th ed., pp. 553–617). New York: Wiley.

Hartshorne, H., & May, M. S. (1928–1930). *Studies in the nature of character* (Vols. 1–3). New York: Macmillan.

Hay, D. F., & Angold, A. (1993). Introduction: Precursors and causes in development and pathogenesis. In D. F. Hay & A. Angold (Eds.), *Precursors and causes in development and psychopathology* (pp. 1–22). Chichester, England: Wiley.

Hearst, E. (Ed.). (1979). *The first century of experimental psychology.* Hillsdale, NJ: Erlbaum.

Herrnstein, R. J., & Murray, C. (1994). *The bell curve: Intelligence and class structure in American life.* New York: Free Press.

Hilgard, J. (1933). The effect of early and delayed practice on memory and motor performances studied by the method of co-twin control. *Genetic Psychology Monographs, 14,* 493–567.

Hinde, R. A. (1966). *Animal behavior.* New York: McGraw-Hill.

Hinde, R. A. (1970). *Animal behavior: A synthesis of ethology and comparative psychology* (2nd ed.). New York: McGraw-Hill.

Hofer, M. A. (1994). Hidden regulators in attachment, separation, and loss. *Monographs of the Society for Research in Child Development, 59*(2–3, Serial No. 240).

Hollingworth, H. L. (1927). *Mental growth and decline: A survey of developmental psychology.* New York: Appleton.

Holt, L. E. (1916). *The care and feeding of children: A catechism for the use of mothers and children's nurses* (8th ed. rev.). New York: Appleton. (Original work published 1894)

Hood, K. E., Greenberg, G., & Tobach, E. (Eds.). (1995). *Behavioral development: Concepts of approach/withdrawal and integrative levels.* New York: Garland.

Horney, K. (1937). *The neurotic personality of our time.* New York: Norton.

Horowitz, F. D. (1992). John B. Watson's legacy: Learning and environment. *Developmental Psychology, 28,* 360–367.

Hull, C. L. (1943). *Principles of behavior.* New York: Appleton-Century-Crofts.

Hull, C. L. (1951). *Essentials of behavior.* New Haven, CT: Yale University Press.

Hunt, J. M. (1961). *Intelligence and experience.* New York: Ronald Press.

Hurlock, E. B. (1924). The value of praise and reproof as incentives for children. *Archives of Psychology, 11*(71).

Jackson, D. D. (Ed.). (1968). *Communication, family, and marriage.* Palo Alto, CA: Science and Behavior Books.

Jacobs, J. (1887). Experiments on "prehension." *Mind, 12,* 75–79.

James, W. (1890). *The principles of psychology* (Vol. 1). New York: Macmillan.

James, W. (1894). Review of "internal speech and song." *Psychological Review, 1,* 209–210.

James, W. (1900). *Talks to teachers on psychology: And to students on some of life's ideals.* New York: Holt.

Jenkins, J. J., & Paterson, D. G. (Eds.). (1961). *Studies in individual differences: The search for intelligence.* New York: Appleton-Century-Crofts.

Jennings, H. S. (1898–1899). The psychology of a protozoan. *American Journal of Psychology, 10,* 503–515.

Jennings, H. S. (1906). *Behavior of the lower organisms.* New York: Macmillan.

Jensen, D. D. (1962). Foreword to the reprinted edition. In H. S. Jennings, *Behavior of the lower organisms* (pp. ix–xvii). Bloomington: Indiana University Press.

Jersild, A. T. (1932). *Training and growth in the development of children: A study of the relative influence of learning and maturation* (Child Development Monographs No. 10). New York: Columbia University Press, Teachers College.

Jersild, A. T., Markey, F. V., & Jersild, C. L. (1933). *Children's fears, dreams, wishes, daydreams, likes, dislikes, pleasant and unpleasant memories: A study by the interview method of 400 children aged 5 to 12* (Child Development Monographs No. 12). New York: Columbia University Press, Teachers College.

Jones, E. (1953). *The life and work of Sigmund Freud* (Vol. 1). New York: Basic Books.

Jones, H. E. (1930). The galvanic skin reflex in infancy. *Child Development, 1,* 106–110.

Jones, H. E. (1954). The environment and mental development. In L. Carmichael (Ed.), *Manual of child psychology* (2nd ed., pp. 631–696). New York: Wiley.

Jones, M. C. (1924). A laboratory study of fear: The case of Peter. *Pedagogical Seminary, 31,* 308–315.

Jones, M. C. (1931). The conditioning of children's emotions. In C. Murchison (Ed.), *A handbook of child psychology* (pp. 71–93). Worcester, MA: Clark University Press.

Kamin, L. J. (1974). *The science and politics of IQ.* Hillsdale, NJ: Erlbaum.

Katz, D., & Katz, R. (1927). *Gespräche mit Kindern: Untersuchungen zur Sozialpsychologie und Padagogik.* Berlin, Germany: Springer.

Kendler, H. H., & Kendler, T. S. (1962). Vertical and horizontal processes in problem solving. *Psychological Review, 69,* 1–16.

Kessen, W. (1965). *The child.* New York: Wiley.

Klopfer, P. H., & Hailman, J. P. (1967). *An introduction to animal behavior: Ethology's first century.* Englewood Cliffs, NJ: Prentice-Hall.

Kohlberg, L. (1969). Stage and sequence: The cognitive-developmental approach to socialization. In D. A. Goslin (Ed.), *Handbook of socialization theory and research* (pp. 347–480). Chicago: Rand McNally.

Kohlberg, L. (1982). Moral development. In J. M. Broughton & D. J. Freeman-Moir (Eds.), *The cognitive developmental psychology of James Mark Baldwin: Current theory and research in genetic epistemology* (pp. 277–325). Norwood, NJ: Ablex.

Krasnogorski, N. I. (1925). The conditioned reflex and children's neuroses. *American Journal of Diseases in Children, 30,* 753–768.

Kreppner, K. (1992). William L. Stern, 1871–1938: A neglected founder of developmental psychology. *Developmental Psychology, 28,* 539–547.

Kreppner, K. (1994). William L. Stern: A neglected founder of developmental psychology. In R. D. Parke, P. A. Ornstein, J. J. Rieser, & C. Zahn-Waxler (Eds.), *A century of developmental psychology* (pp. 311–331). Washington, DC: American Psychological Association.

Kuenne, M. R. (1946). Experimental investigation of the relation of language to transposition behavior in young children. *Journal of Experimental Psychology, 36,* 471–490.

Kuo, H. H. (1937). A study of the language development of Chinese children. *Chinese Journal of Psychology, 1,* 334–364.

Kuo, Z.-Y. (1930). The genesis of the cat's response to the rat. *Journal of Comparative Psychology, 11,* 1–35.

Kuo, Z.-Y. (1939). Studies in the physiology of the embryonic nervous system: IV. Development of acetylcholine in the chick embryo. *Journal of Neurophysiology, 2,* 488–493.

Kuo, Z.-Y. (1967). *The dynamics of behavioral development: An epigenetic view.* New York: Random House.

Laub, J. H., & Sampson, R. J. (2004). Strategies for bridging the quantitative and qualitative divide: Studying crime over the life course. *Research in Human Development, 1*(1/2), 81–99.

Lehrman, D. S. (1953). A critique of Konrad Lorenz's theory of instinctive behavior. *Quarterly Review of Biology, 28,* 337–363.

Lehrman, D. S. (1970). Semantic and conceptual issues in the nature-nurture problem. In L. R. Aronson, D. S. Lehrman, E. Tobach, & J. S. Rosenblatt (Eds.), *Development and evolution of behavior: Essays in memory of T. C. Schneirla* (pp. 17–52). San Francisco: Freeman.

Lerner, R. M. (2002). Concepts and theories of human development (3rd ed). Mahwah NJ: Earlbaum.

Lerner, R. M., Jacobs, F., & Wertlieb, D. (Eds.). (2003). Applying developmental science for youth and families: Historical and theoretical foundations. In R. M. Lerner, F. Jacobs, & D. Wertlieb (Eds.), *Handbook of applied developmental science: Vol. 1. Promoting positive child, adolescent, and family development through research, policies, and programs* (pp. 1–30). Thousand Oaks, CA: Sage.

Lewin, K. (1931a). Conflict between Aristotelian and Galileian modes of thought in psychology. *Journal of General Psychology, 5,* 141–177.

Lewin, K. (1931b). Environmental forces in child behavior and development. In C. Murchison (Ed.), *A handbook of child psychology* (2nd ed., pp. 590–625). Worcester, MA: Clark University Press.

Lewin, K. (1935). *A dynamic theory of personality.* New York: McGraw-Hill.

Lewin, K. (1954). Behavior and development as a function of the total situation. In L. Carmichael (Ed.), *Manual of child psychology* (2nd ed., pp. 918–970). New York: Wiley.

Lewin, K., Dembo, T., Festinger, L., & Sears, P. (1944). Level of aspiration. In J. M. Hunt (Ed.), *Handbook of personality and the behavior disorders* (Vol. 1, pp. 333–378). New York: Ronald Press.

Lewin, K., Lippitt, R., & White, R. (1939). Patterns of aggressive behavior in experimentally created "social climates." *Journal of Social Psychology, 10,* 271–299.

Lewis, M., & Brooks-Gunn, J. (1979). *Social cognition and the acquisition of self.* New York: Plenum Press.

Littman, R. A. (1979). Social and intellectual origins of experimental psychology. In E. Hearst (Ed.), *The first century of experimental psychology* (pp. 39–85). Hillsdale, NJ: Erlbaum.

Loeb, J. (1964). *The mechanistic conception of life.* Cambridge, MA: Harvard University Press. (Original work published 1912)

Loomis, A. M. (1931). *A technique for observing the social behavior of nursery school children* (Child Development Monographs No. 5). New York: Columbia University Press, Teachers College.

Lorenz, K. Z. (1935). Der Kumpan in der Umwelt das Vogels. *Journal of Ornithology, 83,* 137–213.

Lorenz, K. Z. (1937). The companion in the bird's world. *Auk, 54,* 245–273.

Maccoby, E. E. (1994). The role of parents in the socialization of children: An historical overview. In R. D. Parke, P. A. Ornstein, J. J. Rieser, & C. Zahn-Waxler (Eds.), *A century of developmental psychology* (pp. 589–615). Washington, DC: American Psychological Association.

Maccoby, E. E., & Masters, J. C. (1970). Attachment and dependency. In P. H. Mussen (Ed.), *Carmichael's manual of child psychology* (3rd ed., Vol. 2, pp. 73–157). New York: Wiley.

Magnusson, D. (Ed.). (1996). *The lifespan development of individuals: Behavioral, neurobiological, and psychosocial perspectives—A synthesis.* New York: Cambridge University Press.

Maher, B. A., & Maher, W. B. (1979). Psychopathology. In E. Hearst (Ed.), *The first century of experimental psychology* (pp. 561–622). Hillsdale, NJ: Erlbaum.

Maier, S. F., Seligman, M. E. P., & Solomon, R. L. (1969). Pavlovian fear conditioning and learned helplessness. In R. Church & B. Campbell (Eds.), *Punishment and adversive behavior* (pp. 299–342). New York: Appleton-Century-Crofts.

Marquis, D. B. (1931). Can conditioned responses be established in the newborn infant? *Journal of Genetic Psychology, 39,* 479–492.

Mason, W. A. (1980). Social ontogeny. In P. Marler & J. G. Vandenbergh (Eds.), *Social behavior and communication.* New York: Plenum Press.

Mason, W. A., & Kinney, M. D. (1974). Redirection of filial attachments in rhesus monkeys: Dogs as mother surrogates. *Science, 183,* 1209–1211.

Mateer, F. (1918). *Child behavior: A critical and experimental study of young children by the method of conditioned reflexes.* Boston: Badger.

McArdle, J. J., & Nesselroade, J. R. (2003). Growth curve analysis in contemporary psychological research. In I. B. Weiner (Editor-in-Chief) & J. A. Schinka & W. F. Velicer (Vol. Eds.), *Handbook of Psychology: Vol. 2. Research methods in psychology* (pp. 447–477). Hoboken, NJ: Wiley.

McCarthy, D. (1931). Language development. In C. Murchison (Ed.), *A handbook of child psychology* (pp. 278–315). Worcester, MA: Clark University Press.

McCarthy, D. (1933). Language development in children. In C. Murchison (Ed.), *A handbook of child psychology* (2nd ed., pp. 329–373). Worcester, MA: Clark University Press.

McCarthy, D. (1946). Language development in children. In L. Carmichael (Ed.), *Manual of child psychology* (pp. 476–581). New York: Wiley.

McCarthy, D. (1954). Language development in children. In L. Carmichael (Ed.), *Manual of child psychology* (2nd ed., pp. 492–630). New York: Wiley.

McDougall, W. (1906–1908). An investigation of the colour sense of two infants. *British Journal of Psychology, 2,* 338–352.

McDougall, W. (1926). *An introduction to social psychology* (Rev. ed.). Boston: Luce.

McGraw, M. (1935). *Growth: A study of Johnny and Jimmy.* New York: Appleton-Century-Crofts.

McGraw, M. B. (1946). Maturation of behavior. In L. Carmichael (Ed.), *Manual of child psychology* (pp. 332–369). New York: Wiley.

McNemar, Q. (1940). A critical examination of the University of Iowa studies of environmental influences upon the IQ. *Psychological Bulletin, 37,* 63–92.

Mead, G. H. (1934). *Mind, self and society.* Chicago: University of Chicago Press.

Miller, N. E., & Dollard, J. (1941). *Social learning and imitation.* New York: McGraw-Hill.

Miller, N. E., Sears, R. R., Mowrer, O. H., Doob, L. W., & Dollard, J. I. (1941). The frustration-aggression hypothesis. *Psychological Review, 48,* 337–342.

Mills, W. (1898). *The nature and development of animal intelligence.* London: Unwin.

Mills, W. (1899). The nature of animal intelligence and the methods of investigating it. *Psychological Review, 6,* 262–274.

Minton, H. L. (1984). The Iowa Child Welfare Research Station and the 1940 debate on intelligence: Carrying on the legacy of a concerned mother. *Journal of the History of the Behavioral Sciences, 20,* 160–176.

Mischel, W. (1973). Toward a cognitive social learning reconceptualization of personality. *Psychological Review, 80,* 252–283.

Mishler, E. G. (2004). Historians of the self: Restorying lives, revising identities. *Research in Human Development, 1*(1/2), 101–121.

Molenaar, P. C. M. (2004). A manifesto on psychology as a idiographic science: Bringing the person back into scientific psychology, this time forever. *Measurement, 2,* 201–218.

Monroe, W. S. (1899). *Die Entwicklung des sozialen Bewusstseins der Kinder.* Berlin, Germany: Reuther & Reichard.

Morgan, C. L. (1896). *Habit and instinct.* London: Edward Arnold.

Morgan, C. L. (1902). "New statement" from Professor Lloyd Morgan. In J. M. Baldwin (Ed.), *Development and evolution* (pp. 347–348). New York: Macmillan.

Morgan, C. L. (1903). *An introduction to comparative psychology.* London: W. Scott. (Original work published 1894)

Morrison, F. J., & Ornstein, P. A. (1996). Cognitive development. In R. B. Cairns, G. H. Elder Jr., & E. J. Costello (Eds.), *Developmental science* (pp. 121–134). New York: Cambridge University Press.

Mowrer, O. H. (1938). Apparatus for the study and treatment of enuresis. *American Journal of Psychology, 51,* 163–168.

Mueller, E. (1972). The maintenance of verbal exchanges between young children. *Child Development, 43,* 930–938.

Mueller, R. H. (1976). A chapter in the history of the relationship between psychology and sociology in America: James Mark Baldwin. *Journal of the History of Behavioral Sciences, 12,* 240–253.

Munn, N. L. (1954). Learning in children. In L. Carmichael (Ed.), *Manual of child psychology* (2nd ed., pp. 374–458). New York: Wiley.

Munn, N. L. (1965). *The evolution and growth of human behavior* (2nd ed.). Boston: Houghton Mifflin.

Munroe, R. L. (1955). *Schools of psychoanalytic thought.* New York: Dryden Press.

Murchison, C. (Ed.). (1931). *A handbook of child psychology.* Worcester, MA: Clark University Press.

Murchison, C. (Ed.). (1933). *A handbook of child psychology* (2nd ed.). Worcester, MA: Clark University Press.

Murchison, C., & Langer, S. (1927). Tiedemann's observations on the development of the mental faculties of children. *Journal of Genetic Psychology, 34,* 205–230.

Murphy, L. B. (1937). *Social behavior and child personality: An exploratory study of some roots of sympathy.* New York: Columbia University Press.

Mussen, P. H. (Ed.). (1970). *Carmichael's manual of child psychology* (Vol. 1–2). New York: Wiley.

Mussen, P. H. (Ed.). (1983). Handbook of child psychology (4th ed.). New York: Wiley.

Nesselroade, J. R., & Ram, N. (2004). Studying instraindividual variability: What we have learned that will help us understand lives in context. *Research in Human Development, 1*(1/2), 9–29.

Oppenheim, R. W. (1973). Prehatching and hatching behavior: Comparative and physiological consideration. In G. Gottlieb (Ed.), *Behavioral embryology* (pp. 163–244). New York: Academic Press.

Oppenheimer, J. M. (1959). Embryology and evolution: Nineteenth century hopes and twentieth century realities. *Quarterly Review of Biology, 34,* 271–277.

Ornstein, P. A. (Ed.). (1978). *Memory development in children.* Hillsdale, NJ: Erlbaum.

Osborn, H. F. (1896). Ontogenetic and phylogenetic variation. *Science, 4,* 786–789.

Paris, S. G. (1978). Coordination of means and goals in the development of mnemonic skills. In P. A. Ornstein (Ed.), *Memory development in children* (pp. 259–273). Hillsdale, NJ: Erlbaum.

Paris, S. G., & Cairns, R. B. (1972). An experimental and ethological investigation of social reinforcement in retarded children. *Child Development, 43,* 717–729.

Parke, R. D., Ornstein, P. A., Rieser, J. J., & Zahn-Waxler, C. (1994). The past is prologue: An overview of a century of developmental psychology. In R. D. Parke, P. A. Ornstein, J. J. Rieser, & C. Zahn-Waxler (Eds.), *A century of developmental psychology* (pp. 1–70). Washington, DC: American Psychological Association.

Parten, M. B. (1933). Social play among preschool children. *Journal of Abnormal and Social Psychology, 28,* 136–147.

Parton, D. A., & Ross, A. O. (1965). Social reinforcement of children's motor behavior: A review. *Psychological Bulletin, 64,* 65–73.

Patterson, G. R. (1979). A performance theory for coercive family interaction. In R. B. Cairns (Ed.), *The analysis of social interactions: Methods, issues, and illustrations* (pp. 119–162). Hillsdale, NJ: Erlbaum.

Pauly, P. J. (1981). The Loeb-Jennings debate and the science of animal behavior. *Journal of the History of the Behavioral Sciences, 17,* 504–515.

Peréz, B. (1878). *La psychologic de l'enfant: Les trois premières an'ees* [The first three years of childhood] (A. M. Christie, Ed. & Trans.). Chicago: Marquis. (Original work published 1851)

Peterson, J. (1925). *Early conceptions and tests of intelligence.* Yonkers-on-Hudson, NY: World Books.

Peterson, J. (1931). Learning in children. In C. Murchison (Ed.), *A handbook of child psychology* (pp. 316–376). Worcester, MA: Clark University Press.

Peterson, R. C., & Thurstone, L. L. (1933). Motion pictures and the social attitudes of children. In W. W. Charters (Ed.), *Motion pictures and youth* (Pt. 3, pp. 1–75). New York: Macmillan.

Phelps, E., Furstenberg, F. F., & Colby, A. (2002). *Looking at lives: American Longitudinal Studies of the Twentieth Century.* New York: Russell Sage Foundation.

Piaget, J. (1926). *The language and thought of the child.* New York: Harcourt Brace. (Original work published 1923)

Piaget, J. (1951). *Play, dreams, and imitation in childhood.* New York: Norton.

Piaget, J. (1952). [Autobiography]. *A History of Psychology in Autobiography, 4,* 237–256.

Piaget, J. (1978). *Behavior and evolution.* New York: Pantheon Books.

Piaget, J. (1984). The role of imitation in the development of representational thought. In G. Voyat (Ed.), *The world of Henri Wallon* (pp. 105–114). New York: Aronson.

Pressey, S. L., Janney, J. E., & Kuhlen, J. E. (1939). *Life: A psychological survey.* New York: Harper.

Preyer, W. (1885). *Specielle Physiologic des Embryo.* Untersuchungen über die Lebenserscheinungen vor der Geburt. Leipzig, Germany: Grieben.

Preyer, W. (1888–1889). *The mind of the child* (Vols. 1–2). New York: Appleton. (Original work published 1882)

Quine, W. V. (1981). *Theories and things.* Cambridge, MA: Belknap Press.

Reinert, G. (1979). Prolegomena to a history of life-span developmental psychology. In P. B. Baltes & O. G. Brim (Eds.), *Life-span development and behavior* (Vol. 2, pp. 205–254). New York: Academic Press.

Romanes, G. J. (1884). *Mental evolution in animals.* New York: Appleton.

Romanes, G. J. (1889). *Mental evolution in man: Origin of human faculty.* New York: Appleton.

Rosenblatt, J. S., & Lehrman, D. S. (1963). Maternal behavior of the laboratory rat. In H. L. Rheingold (Ed.), *Maternal behavior in mammals* (pp. 8–57). New York: Wiley.

Ross, D. G. (1972). *Stanley Hall: The psychologist as prophet.* Chicago: University of Chicago Press.

Rotter, J. B. (1954). *Social learning and clinical psychology.* Englewood Cliffs, NJ: Prentice-Hall.

Sameroff, A. J. (1983). Developmental systems: Contexts and evolution. In P. H. Mussen (Series Ed.) & W. Kessen (Vol. Ed.), *Handbook of child psychology: Vol. 1. History, theory, and methods* (4th ed., pp. 237–294). New York: Wiley.

Schaffer, H. R., & Emerson, P. E. (1964). The development of social attachments in infancy. *Monographs of the Society for Research in Child Development, 29*(3, Whole No. 94).

Schallenberger, M. E. (1894). A study of children's rights, as seen by themselves. *Pedagogical Seminary, 3,* 87–96.

Schneirla, T. C. (1933). Studies on army ants in Panama. *Journal of Comparative Psychology, 15,* 267–299.

Schneirla, T. C. (1957). Theoretical consideration of cyclic processes in Doryline ants. *Proceedings of the American Philosophical Society, 101,* 106–133.

Schneirla, T. C. (1959). An evolutionary and developmental theory of biphasic processes underlying approach and withdrawal. In M. R. Jones (Ed.), *Nebraska Symposium on Motivation, 1958* (pp. 1–42). Lincoln: University of Nebraska Press.

Schneirla, T. C. (1966). Behavioral development and comparative psychology. *Quarterly Review of Biology, 41,* 283–302.

Scott, J. P. (1962). Critical periods in behavioral development. *Science, 138,* 949–958.

Scott, J. P. (1963). *The process of primary socialization in canine and human infants* (Monographs of the Society for Research in Child Development, 28, 1). Lafayette, IN: Child Development.

Sears, R. R. (1944). Experimental analysis of psychoanalytic phenomena. In J. M. Hunt (Ed.), *Personality and the behavior disorders* (Vol. 1, pp. 306–332). New York: Ronald Press.

Sears, R. R. (1951). A theoretical framework for personality and social behavior. *American Psychologist, 6,* 476–483.

Sears, R. R. (1975). Your ancients revisited: A history of child development. In E. M. Hetherington (Ed.), *Review of child development research* (Vol. 5). Chicago: University of Chicago Press.

Sears, R. R., Maccoby, E. E., & Levin, H. (1957). *Patterns of child rearing.* Evanston, IL: Row-Peterson.

Sears, R. R., Rau, L., & Alpert, R. (1965). *Identification and child rearing.* Stanford, CA: Stanford University Press.

Sears, R. R., Whiting, J. W. M., Nowlis, V., & Sears, P. S. (1953). Some child-rearing antecedents of aggression and dependency in young children. *Genetic Psychology Monographs, 47,* 135–234.

Senn, M. J. E. (1975). Insights on the child development movement in the United States. *Monographs of the Society for Research in Child Development, 40*(Serial No. 161).

Sewney, V. D. (1945). *The social theory of James Mark Baldwin.* New York: King's Crown Press.

Shakow, D., & Rapaport, D. (1964). *The influence of Freud on American psychology.* New York: International Universities Press.

Sherman, M., & Key, C. B. (1932). The intelligence of isolated mountain children. *Child Development, 3,* 279–290.

Shinn, M. (1893–1899). Notes on the development of a child. *University of California Publications, 1.*

Shirley, M. M. (1931). *The first two years. A study of twenty-five babies: Vol. 1. Postural and locomotor development.* Minneapolis: University of Minnesota Press.

Shirley, M. M. (1933a). *The first two years. A study of twenty-five babies: Vol. 2. Intellectual development.* Minneapolis: University of Minnesota Press.

Shirley, M. M. (1933b). *The first two years. A study of twenty-five babies: Vol. 3. Personality manifestations.* Minneapolis: University of Minnesota Press.

Siegler, R. S. (1992). The other Alfred Binet. *Developmental Psychology, 28,* 179–190.

Skeels, H. M. (1966). Adult status of children with contrasting early life experiences. *Monographs of the Society for Research in Child Development, 31*(3, Whole No. 105).

Skeels, H. M., Updegraff, R., Wellman, B. L., & Williams, H. M. (1938). A study of environmental stimulation: An orphanage preschool project. *University of Iowa Studies in Child Welfare, 15*(4).

Skinner, B. F. (1938). *The behavior of organisms: An experimental analysis.* New York: Appleton-Century-Crofts.

Skinner, B. F. (1953). *Science and human behavior.* New York: Macmillan.

Skrondal, A., & Rabe-Hesketh, S. (2004). *Generalized latent variable modeling: Multilevel, longitudinal, and structural equation models.* Boca Raton: Chapman & Hall.

Smith, L. B., & Thelen, E. (Eds.). (1993). *A dynamic systems approach to development: Applications.* Cambridge, MA: MIT Press.

Solomon, R. L., & Wynne, L. C. (1953). Traumatic avoidance learning: Acquisition in normal dogs. *Psychological Monographs, 67*(Whole No. 354).

Spalding, D. A. (1873). Instinct: With original observations in young animals. *Macmillan's Magazine, 27,* 282–293.

Spelt, D. K. (1938). Conditioned responses in the human fetus in utero. *Psychological Bulletin, 35,* 712–713.

Spemann, H. (1938). *Embryonic development and induction.* New Haven, CT: Yale University Press.

Spencer, H. (1886). *A system of synthetic philosophy: Vol. 1. First principles* (4th ed.). New York: Appleton.

Spock, B. (1946). *The common sense book of baby and child care.* New York: Duell, Sloan and Pearce.

Stern, W. (1911). *Die differentielle Psychologic in ihren methodischen Grundlagen.* Leipzig, Germany: Barth.

Stern, W. (1914). *The psychological methods of testing intelligence* (F. M. Whipple, Trans.). Baltimore: Warwick & York.

Stern, W. (1918). *Grundgedanken der personalistischen Philosophie.* Berlin, Germany: Reuther & Reichard.

Stevenson, H. W. (1965). Social reinforcement with children. In L. P. Lipsitt & C. C. Spiker (Eds.), *Advances in child development and behavior* (Vol. 2, pp. 97–126). New York: Academic Press.

Sullivan, H. S. (1940). Some conceptions of modern psychiatry. *Psychiatry, 3,* 1–117.

Sullivan, H. S. (1953). *The interpersonal theory of psychiatry.* New York: Norton.

Sulloway, F. J. (1979). *Freud, biologist of the mind: Beyond the psychoanalytic legend.* New York: Basic Books.

Sully, J. (1896a). Review of "Mental development in the child and the race: Methods and processes." *Mind, 5,* 97–103.

Sully, J. (1896b). *Studies of childhood.* New York: Appleton.

Suomi, S. J., & Harlow, H. F. (1972). Social rehabilitation of isolate-reared monkeys. *Developmental Psychology, 6,* 487–496.

Taine, H. (1876). Note sur l'acquisition du langage chez les enfants et dans l'espèce humaine. *Revue Philosophique, 1,* 3–23.

Terman, L. M. (1906). Genius and stupidity. *Pedagogical Seminary, 13,* 307–313.

Terman, L. M. (1916). *The measurement of intelligence.* Boston: Houghton Mifflin.

Terman, L. M. (1925). *Genetic studies of genius: Vol. 1. Mental and physical traits of a thousand gifted children.* Stanford, CA: Stanford University Press.

Thelen, E., & Adolph, K. E. (1992). Arnold L. Gesell: The paradox of nature and nurture. *Developmental Psychology, 28,* 368–380.

Thelen, E., & Smith, L. B. (Eds.). (1994). *A dynamic systems approach to the development of cognition and action.* Cambridge, MA: MIT Press.

Thieman, T. J., & Brewer, W. F. (1978). Alfred Binet on memory for ideas. *Genetic Psychology Monographs, 97,* 243–264.

Thomas, D. S. (1929). *Some new techniques for studying social behavior* (Child Development Monographs No. 1). New York: Columbia University Press, Teachers College.

Thomas, W. I., & Thomas, D. S. (1928). *The child in America: Behavior problems and programs.* New York: Knopf.

Thompson, R. F., & Robinson, D. N. (1979). Physiological psychology. In E. Hearst (Ed.), *The first century of experimental psychology* (pp. 407–454). Hillsdale, NJ: Erlbaum.

Thorndike, E. L. (1898). Animal intelligence: An experimental study of the associative processes in animals. *Psychological Monographs, 2*(Whole No. 8).

Thurstone, L. L. (1952). [Autobiography]. *A History of Psychology in Autobiography, 5,* 295–331.

Tiedemann, D. (1787). Beobachtungen über die Entwickelung der Seelenfähigkeiten bei Kindern. *Hessische Beiträge zur Gelehrsamkeit und Kunst, 2*(2–3, Whole No. 6–7).

Tinbergen, N. (1972). *The animal in its world: Explorations of an ethologist, 1932–1972.* London: Allen & Unwin.

Tolman, E. C. (1932). *Purposive behavior in animals and men.* New York: Appleton-Century-Crofts.

Valsiner, J. (Ed.). (1986). *The individual in scientific psychology.* New York: Plenum Press.

Valsiner, J. (1988). *Developmental psychology in the Soviet Union.* Brighton, England: Harvester Press.

Valsiner, J., & van der Veer, R. (1988). On the social nature of human cognition: An analysis of the shared intellectual roots of George Herbert Mead and Lev Vygotsky. *Journal for the Theory of Social Behavior, 18,* 117–135.

Valsiner, J., & van der Veer, R. (1993). The encoding of distance: The concept of the zone of proximal development and its interpretations. In R. R. Cocking & K. A. Renninger (Eds.), *The development and meaning of psychological distance* (pp. 35–62). Hillsdale, NJ: Erlbaum.

van der Veer, R., & Valsiner, J. (1991). *Understanding Vygotsky: A quest for synthesis.* Oxford, England: Blackwell.

Viteles, M. S. (1932). *Industrial psychology.* New York: Norton.

von Baer, K. E. (1828–1837). *Über Entwickelungsgeschichte der Thiere: Beobachtung und Reflexion* (Vols. 1–2). Königsberg: Bornträger.

von Bertalanffy, L. (1933). *Modern theories of development: An introduction to theoretical biology* (J. H. Woodger, Trans.). London: Oxford University Press.

Vonèche, J. J. (1982). Evolution, development, and the growth of knowledge. In J. M. Broughton & D. J. Freeman-Moir (Eds.), *The cognitive developmental psychology of James Mark Baldwin: Current theory and research in genetic epistemology* (pp. 51–79). Norwood, NJ: Ablex.

von Eye, A. (1990). *Statistical methods in longitudinal research: Principles and structuring change.* New York: Academic Press.

von Eye, A., & Bergman, L. R. (2003). Research strategies in developmental psychopathology: Dimensional identity and the person-oriented approach. *Development and Psychopathology, 15,* 553–580.

von Eye, A., & Gutiérrez Peña, E. (2004). Configural Frequency Analysis: The search for extreme cells. *Journal of Applied Statistics, 31,* 981–997.

Vygotsky, L. S. (1939). Thought and speech. *Psychiatry, 2,* 29–54.

Vygotsky, L. S. (1962). *Thought and language.* Cambridge, MA: MIT Press.

Vygotsky, L. S., & Luria, A. R. (1929). The function and fate of egocentric speech. *Proceedings and Papers of the 9th International Congress of Psychology,* 464–465.

Waddington, C. H. (1939). *An introduction to modern genetics.* New York: Macmillan.

Waddington, C. H. (1971). Concepts of development. In E. Tobach, L. R. Aronson, & E. Shaw (Eds.), *The biopsychology of development* (pp. 17–23). New York: Academic Press.

Wallon, H. (1984a). Genetic psychology. In G. Voyat (Ed.), *The world of Henri Wallon* (pp. 15–32). New York: Aronson.

Wallon, H. (1984b). The psychological and sociological study of the child. In G. Voyat (Ed.), *The world of Henri Wallon* (pp. 205–224). New York: Aronson.

Walters, R. H., & Parke, R. D. (1964). Social motivation, dependency and susceptibility to social influence. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 1, pp. 232–276). New York: Academic Press.

Warren, H. C. (1894). Review of Binet's L'introduction à la psychologie expérimentale. *Psychological Review, 1,* 530–531.

Washburn, R. W. (1929). A study of the smiling and laughing of infants in the first year of life. *Genetic Psychology Monographs, 6,* 397–537.

Watson, J. B. (1914). *Behavior: An introduction to comparative psychology.* New York: Henry Holt.

Watson, J. B. (1926). What the nursery has to say about instincts. In C. Murchison (Ed.), *Psychologies of 1925* (pp. 1–35). Worcester, MA: Clark University Press.

Watson, J. B. (1928). *Psychological care of infant and child.* New York: Norton.

Watson, J. B. (1936). [Autobiography]. *History of Psychology in Autobiography, 3,* 271–281.

Watson, J. B., & Morgan, J. J. B. (1917). Emotional reactions and psychological experimentation. *American Journal of Psychology, 28,* 163–174.

Watson, J. B., & Rayner, R. A. (1920). Conditional emotional reactions. *Journal of Experimental Psychology, 3,* 1–14.

Werner, H. (1948). *Comparative psychology of mental development* (Rev. ed.). Chicago: Follett. (Original work published 1940)

Wheeler, L. R. (1942). A comparative study of East Tennessee mountain children. *Journal of Educational Psychology, 33,* 321–334.

White, S. H. (1992). G. Stanley Hall: From philosophy to developmental psychology. *Developmental Psychology, 28,* 25–34.

White, S. H. (1996). The relationship of developmental psychology to social policy. In E. F. Zigler, S. L. Kagan, & N. W. Hall (Eds.), *Children, families, and governments: Preparing for the twenty-first century* (pp. 409–426). New York: Cambridge University Press.

Whiting, B. B., & Whiting, J. W. M. (1975). *Children of six cultures: A psycho-cultural analysis.* Cambridge, MA: Harvard University Press.

Wickens, D. D., & Wickens, C. D. (1940). A study of conditioning in the neonate. *Journal of Experimental Psychology, 26,* 94–102.

Willett, J. B. (2004). Investigating individual change and development: The multilevel model for change and the method of latent growth modeling. *Research in Human Development, 1*(1/2), 31–57.

Wilson, E. O. (1975). *Sociobiology: The new synthesis.* Cambridge, MA: Harvard University Press.

Wohlwill, J. (1973). *The study of behavioral development.* New York: Academic Press.

Wolf, T. H. (1973). *Alfred Binet.* Chicago: University of Chicago Press.

Wozniak, R. J. (1982). Metaphysics and science, reason and reality: The intellectual origins of genetic epistemology. In J. M. Broughton & D. J. Freeman-Moir (Eds.), *The cognitive developmental psychology of James Mark Baldwin: Current theory and research in genetic epistemology* (pp. 13–45). Norwood, NJ: Ablex.

Wozniak, R. J. (Ed.). (1993). *The roots of behaviourism.* London: Routledge/Thoemmes Press.

Wozniak, R. J. (Ed.). (1995). *Mind, adaptation, and childhood.* London: Routledge/Thoemmes Press.

Wundt, W. (1907). *Outlines of psychology* (C. H. Judd, Trans.). New York: Stechert.

Wundt, W. (1916). *Elements of folk psychology: Outlines of a psychology history of the development of mankind.* New York: Macmillan.

Yarrow, M. R., Campbell, J. D., & Burton, R. V. (1968). *Child rearing: An inquiry into research and methods.* San Francisco: Jossey-Bass.

Young, C. H., Savola, K. L., & Phelps, E. (1991). *Inventory of longitudinal studies in the social sciences.* Newbury Park, CA: Sage.

Young, K. (1924). The history of mental testing. *Pedagogical Seminary, 31,* 1–48.

Zazzo, R. (1984). Who is Henri Wallon. In G. Voyat (Ed.), *The world of Henri Wallon* (pp. 7–14). New York: Aronson.

Zenderland, L. (1988). From psychological evangelism to clinical psychology: The child-study legacy. *Journal of the History of the Behavioral Sciences, 24,* 152–165.

CHAPTER 4

Developmental Epistemology and Implications for Methodology

JAAN VALSINER

LOOKING AT CHILDREN: ADULTS' PLAYGROUND 167
Blinder 1: Monocultural Assumptions 168
Blinder 2: Reducing Complexity to Socially Accepted Norms 168
DEVELOPMENTAL SCIENCE IN THE MAKING 169
BASICS OF SCIENCE: CONSISTENCY OF CONCEPTS, PHENOMENA, AND METHODS 170
Intellectual Interdependency of Social Sciences: Episodic Growth Spurts 170
Pathways to Objectivity 171
Organizing Knowledge Construction: Frames of Reference 173
Methodology as an Epistemic Cycle 175
FOUNDATIONS OF DEVELOPMENTAL THINKING 177
Special Axiomatic Features of Development 177
Multilevel Nature of Developmental Processes 178
DEVELOPMENTAL SYSTEMS ANALYSIS: RETHINKING MORGAN'S CANON 179
Systemic Causality in the Biological and Psychological Worlds 180
Dynamic Hierarchies in Developmental Processes 182
Variability Is the Phenomenon and Not an "Error" 183
CENTRALITY OF FUNCTIONAL STRUCTURING 185
Centrality of Transfer and (Synthetic) Units of Analysis 186
CONSTRUCTING GENERAL MODELS FOR DEVELOPMENTAL SCIENCE 186
Differentiation and Equilibration: Dynamics of Structures 187
James Mark Baldwin and the Developmental Logic (Genetic Logic) 187
Pierre Janet and the Hierarchy of Psychological Functions 188
Heinz Werner's Differentiation Model 189
George Herbert Mead: Coordination of the Self and the Other 190
Mikhail Basov's Theory of Dynamic Structural Forms 194
Kurt Lewin's Topological Psychology 194
Processes in the Field of Life Space 194
DYNAMIC APPROACHES IN DEVELOPMENTAL PSYCHOLOGY 195
Dynamic Systems Theory 195
Progressing Equilibration 196
Development through Disequilibriae: Peirce, Bergson, and Piaget 196
Development through "As-If" Structures Unfolding in Time 198
Post-Piagetian and Post-Vygotskian Models 199
CULTURE IN HUMAN DEVELOPMENT 200
Focus on Participation 200
Dialogical Models of the Self 201
CONCLUSIONS: FROM DEVELOPMENTAL MODELS TO NEW METHODOLOGY 201
REFERENCES 202

> [T]he basic law of all mental development [is that] what follows always originates from what precedes and nevertheless appears opposed to it as a new creation . . . every stage of [this] development is already contained in the preceding and is, at the same time, a new phenomenon.
>
> (Wundt, 1900/1973, p. 149)

Child psychology is not necessarily developmental psychology, and developmental psychology only partially deals with children. Children can be studied both in terms of as they are (nondevelopmental child psychology) and as they are in the process of becoming (developmental psychology). Similarly, other systems—natural or cultural—can be investigated either as they develop, or as

This chapter benefited from the input from Kurt Fischer, Gilbert Gottlieb, and particularly from the constructive critique of Nancy Budwig, Miguel Gonçalves, and Richard Lerner on an earlier version of the manuscript.

they exist in some state of status quo. The study of children is developmental only if it is done from an axiomatic standpoint that highlights processes of transformation and emergence (Valsiner & Connolly, 2003).

Children are of social interest in any society—and so is the area of child psychology. Over the twentieth century, child psychology developed in different ways in different societies. Not surprisingly, it is the cultural-historical niche that children occupy in a given country at the given time that guides the implementation of child-oriented social action programs (Salvatore & Pagano, 2005; Valsiner, 2003d). In Europe, child psychology was historically built on developmental biology and reflects the issues of both biological growth and psychological development. In North America, it was built on the social utility of child-related knowledge. Child psychology borrowed its focus from the child study (paedology) movement—which was from the beginning an interdisciplinary effort to understand children's ways of being, including development (Hall, 1883). The focus of understanding children was practical rather than theoretical, and the social utility of knowledge about children prevailed over basic science. Concerns about the welfare of children in a given society seem to motivate psychologists to study children. In contrast, basic developmental science was built on empirical knowledge from other species (e.g., ants—T. C. Schneirla; ducks—G. Gottlieb).

My goal in this chapter is to demonstrate how our contemporary efforts to create general developmental science can transcend the historically established blinders of child psychology. Developmental science is built on the comparative perspective (Valsiner, 2001a) in three ways:

1. Contrasting the development (ontogenetic and phylogenetic) of different species,
2. Considering variability within the species (of humans, first of all—but also those of higher primates), and
3. Emphasizing historical transformations of the minds and societies.

Knowledge about child development needs a methodological framework that equally emphasizes the theoretical and empirical sides of investigation. Our research efforts are empirical, yet their goal is general knowledge and not the mere accumulation of data. Science is about universal knowledge—and psychology deals with generalizations about phenomena that are excessively context specific.

This claim that general knowledge can emerge from the study of context-bound, unique phenomena is not a contradiction of terms. It merely indicates a new challenge to the science: How to find the generality in the never-ending flow of particular phenomena?

LOOKING AT CHILDREN: ADULTS' PLAYGROUND

We study children in child psychology, yet the questions we ask and how we attempt to answer those questions remains anchored in our adult psychological concerns. We study infants to prove that certain early psychological functions are precocious—known as "inborn" (see Fischer & Bidell, Chapter 7, this *Handbook,* this volume, on the fallacy of that argument). The contrast of nature *versus* nurture haunts child psychology, forcing researchers into numerous disputes about their role (rather than leave the contrast behind). For example, we may find the at-risk or delinquent behavior of adolescents—smoking, lies, and music videos; often a part of the exploration of their lives (e.g., thrill-seeking: Lightfoot, 1997)—and investigate these "problems." Yet, study of development usually ends in young adulthood. Thus, child development textbooks fit under the heading of "psychology of adolescents" and are written from the sociomoral perspective of the parents of these adolescents (Lightfoot, 1997; Valsiner, 2000c, see chap. 13 for detailed coverage).

There are curious gaps in unstudied areas. The closer in age the children comes to the researcher, the less their development is focused on. We do not include playfulness of 35-year-olds (or 75-year-olds) in our studies of development, even if human beings are gregarious all through their life course. But there had not been much attention to adults as developing persons—until the new areas of "life-span development" (Baltes, Lindenberger, & Staudinger, 1998; C. Bühler, 1934) and "life-course development" (Elder & Shanahan, Chapter 12, this *Handbook,* this volume) emerged. The role of human action in its cultural contexts is relevant from birth to death (see Brandtstädter, Chapter 10, this *Handbook,* this volume).

Child psychology seems to pride itself for being an empirical science, thus implying a contrast with a

nonempirical approach, whether that be ideological, theoretical, or any other concept. Yet, ironically, such claims allow for various nonempirical limitations—*conceptual blinders*—to guide the discipline.

Blinder 1: Monocultural Assumptions

Child psychology's writing about children is based on the narrow perspective of Western cultural histories and sociomoral concerns; it does not represent knowledge of human children in general. The researchers' social position (usually that of an upwardly mobile middle class—who earns its credentials accepting the demands of social institutions) looks at the children of other social classes (usually lower in the power hierarchy rather than higher) as something to be modified by benevolent actions. This applies both in a societal group (e.g., intervention with the children of the disadvantaged) and across societies (e.g., bringing Western assumptions about the right ways of children's development to the villagers in Africa, or immigrant communities in Europe or North America).

Our contemporary cultural psychology has revealed a "cultural myopia" of Occidental child psychology (Chaudhary, 2004; Rogoff, 2003) so that even our contemporary development of cross-cultural and cultural psychologies have not overcome the problem. The differences between societies are usually seen as those between children, although those differences may begin with the assumptions of adults. There exist many cross-cultural comparisons that reveal these limits. In Japan, when the child is troublesome, the typical message of the Japanese mother is "I am one with you"—a symbiotic relationship. These families are considered "unhealthy" from the Western psychological standpoint:

> A hypothetical Turkish clinical psychologist, fresh out of his or her professional training in the United States, who goes to a Turkish village would face a similar dilemma. Observing the human relationships there, he or she would declare the whole village to be enmeshed, with everybody overlapping with everybody else. (Kagitçibasi, 2003, pp. 167–168)

The world is not normatively segregated into persons who are separate from their social contexts. Just the opposite: They are actively enmeshed in those contexts (hence the need for person-context analysis; Magnusson & Stattin, Chapter 8, this *Handbook,* this volume), and some forms of such active involvement are intuitively foreign to monoculturally fixated researchers (e.g., Benigni & Valsiner, 1995, discussion of "amoral familism" as seen by American political science in Italy). Furthermore, researchers who are "migrants" moving between societies may be "enmeshed" in their professional socialization (which has an emphasis on nonenmeshment) in ways similar to that of their research participants' enmeshment in their lay worlds.

Blinder 2: Reducing Complexity to Socially Accepted Norms

Child psychology has encountered a huge variety of developmental forms, yet it has failed to develop adequate general theoretical models to explain that complexity (Fischer & Bidell, Chapter 7, this *Handbook,* this volume). The complexity (and dynamics) of developmental phenomena calls for the use of different versions of contemporary—mostly qualitative—mathematical models to provide us with general models. Instead, most of child psychology continues to thrive on the basis of reduction of complexity to averaged data and considering these averages as established general norms.

Child psychology repeatedly commits the *pars pro toto* error. For example, looking at a "child in the family context" takes one form of family relations—a neolocal dyadic family where parents dominate, which is historically prominent in Europe and North America—and turns it into a generalized norm. As a result, the role of grandparents, side relatives, siblings, servants, and the like does not remain in focus. When the activities of such kin group around the child are unavoidable during observation, the researchers become puzzled by the "enmeshed" nature of the child. Indeed, the enmeshed family is the worldwide norm, and the Occidental differentiated form is the exception. Instead of looking at the consequences of the historical nuclearization of families and the corresponding psychological differentiation of the person out of the normal state of "enmeshment" (i.e., a developmental question), researchers revert to contrasts between the established final forms of the enmeshed *versus* the individual ways of being. The constructed opposites are then ordered with the researcher's own evaluation ending up as a positive anchor point.

An analogy with evolutionary biology might fit here. Consider the possibility that all—or most—knowledge about primates comes from research laboratories, zoos,

or situations where these primates are kept as pets, and excludes direct observations of these primates in their variety of natural habitats. Empirical knowledge would accumulate well and be internally coherent but not necessarily adequate. Charles Darwin undertook his voyage on *The Beagle* precisely to diversify the data set of biological knowledge base in his time. Our contemporary child psychology's look at the data from European or North American specific cultural contexts of the recent decades, as if that were the norm for children's ways of being in their contexts, would be similar to inferring norms for animal species at large from zoo animals in evolutionary biology. Undoubtedly, animals in zoos, like professionals in their middle-class environments, live in real contexts. Yet, these contexts are specific historical particulars rather than species' universal conditions.

Direct studies that address processes of development are rare in contemporary child psychology. Reasons for limited and selective incorporation of developmental ideas in child study continue to be closely linked with the ideological and applied demands of society on developing child psychology (Valsiner, 1988). Children and adolescents in any society are ideologically guided by their elders, as their role has been crucial in economies at every level of economic advancement of societies. Children have been participating in societies on both the sides of producers and consumers (Nieuwenhuys, 2003), buyers and sellers, as well as destroyers and healers. For example, their playful energies are utilized in the selling of newspapers in the streets, or Girl Scout cookies to middle-class homes or studying in schools, or—last but not least—recruiting child soldiers into armies (Hundeide, 2005). The innovating potential of the young is utilized by the social powers to fit their institutional goals—rather than for the sake of the humanity or the rights of the children.

The innovative capacities of the young are not only human privilege. Juvenile primates invent new actions and lead the process of social change (Hirata, Watanabe, & Kawai, 2001; Kawamura, 1959). All these tasks entail the production of novelty; yet, novelty is also something that by its definition is not pre-controllable. Endorsing development involves both innovation and rupture with the past, so it may lead to progress or devastation and bear substantial risks. Such uncertainty fortifies the need for knowledge about the future of children's development, giving child psychologists their role in society. Yet such a role remains set up as similar to that of fortune-tellers—while actual understanding of child development requires the movement from child study to developmental science.

DEVELOPMENTAL SCIENCE IN THE MAKING

Ambivalence about development, as innovation together with a break in what is known (i.e., a loss), repeated itself throughout the history of making child psychology developmental in its nature. Implementation of developmental ideas has been slow and filled with a recurrent erosion of focus (Cairns, 1998, Chapter 3, this *Handbook,* this volume).

By the end of the twentieth and the beginning of the twenty-first century, we witnessed the growth of a new discipline: *developmental science*. This new discipline transcended the boundaries of child psychology and addressed issues of development in general. Its focus was on person-context relations (see Magnusson & Stattin, Chapter 8, this *Handbook,* this volume) and it built on the general perspective of probabilistic epigenesis (Gottlieb, 1999; Gottlieb, Wahlsten, & Lickliter, Chapter 5, this *Handbook,* this volume).

Since the mid-1990s, the new science has become established in a number of ways. There are now journals, *Developmental Science* (since 1998) and *Applied Developmental Science* (since 1997), and a new handbook, *Handbook of Applied Developmental Science* (Lerner, Jacobs, & Wertlieb, 2003). The label developmental science is inherently appealing to our thinking and is relevant in our social discourses in which issues of development are progressive for institutional uses.

Developmental science is a label meant to hold together the intellectual rebirth of a general perspective that is oriented toward the study of developmental processes. Developmental science, as stated in the mid-1990s:

> refers to a fresh synthesis that has been generated to guide research in the social, psychological, and biobehavioral disciplines. It describes a general orientation for linking concepts and findings of hitherto disparate areas of developmental inquiry, and it emphasizes the dynamic interplay of processes across time frames, levels of analysis, and contexts. Time and timing are central to this perspective. The time frames employed are relative to the lifetime of the phenomena to be understood. Units of focus can be as short as milliseconds, seconds, and minutes, or as long as years, decades, and millennia. In this perspective, the phenomena of individual functioning are viewed at multiple levels—from the subsystems of genetics, neurobiology,

> and hormones to those of families, social networks, communities, and cultures. (Carolina Consortium on Human Development, 1996, p. 1)

As stated, the general developmental orientation is charted on a wide scale, within which the development of human children in their social contexts is but one of the areas of inquiry. The impact of the development from the Carolina Consortium was prominent in the fifth edition of this *Handbook,* and continues to be so in this edition (e.g., Bronfenbrenner & Morris, Chapter 14; Cairns, Chapter 3; Elder & Shanahan, Chapter 12; Gottlieb, Wahlsten, & Lickliter, Chapter 5; Magnusson & Stattin, Chapter 8, this *Handbook,* this volume).

Conceptual difficulties in making sense of development are inevitable in the growth of a science that faces a most difficult phenomenon—a constantly changing object of study. The difficulty in the study of development lies in its complexity, dynamic change, and the lack of a common terminology (Valsiner, 2005b; van Geert, 1986, 1988, 1998, 2003). The major theoretical question is how to conceptualize this complexity and make productive use of psychologists' mainly empirical interests for creating a general understanding of development.

Child psychologists have been working on a multitude of empirical topics with limited concepts of development. In some cases this need not matter—nondevelopmental approaches to the study of children as they are (and not as they are about to become) do not require the adoption of any developmental theoretical framework. The discrepancy between the theoretical and empirical domains in child psychology is scientifically deleterious in those cases where the "developmental perspective" is being claimed in the theoretical realm—but the empirical research methods are not set up to study development. This leads to the dissociation of specific and general knowledge (Shanahan, Valsiner, & Gottlieb, 1996). General knowledge easily vanishes behind the myriad of topic- and context-specific empirical findings, thus the discipline faces a metaphorical loss of the forest behind the trees. Yet it is the universal, basic knowledge that is the result of empirical explorations in science—not mere "accumulation of the data."

BASICS OF SCIENCE: CONSISTENCY OF CONCEPTS, PHENOMENA, AND METHODS

Because psychology—developmental as well as nondevelopmental—is a basic science, its conceptual apparatus needs to be systematically organized and sufficiently generalized. If compared to chemistry, psychology is somewhere beyond the dominance of alchemy but still without the deductive rigor of the Mendeleev's periodicity table (Brush, 1996). While basic science has emphasized its abstract and formal nature of knowledge, without losing touch with critical empirical questions, psychology has become an empirical science with a major loss of abstract generalized knowledge. The socially embedded nature of the history of psychology can explain the nonmonotonic growth of the discipline.

Intellectual Interdependency of Social Sciences: Episodic Growth Spurts

Social sciences develop by intense "burst periods" in different countries (Valsiner, 2003c). In the history of different countries, there have been demonstrably productive rapid growth periods of knowledge and invention of new understanding: the United States in the 1890s and early 1900s, as well as after World War II; Russia and Germany in the 1920s, and so on (Valsiner & van der Veer, 2000).

Social Interdependency of Psychology

Psychology has always existed under the influence of the societies in which it has been embedded (Dolby, 1977). Throughout the twentieth century, new forms of science-society relations have guided psychology away from general theory construction (Benetka, 2002; Danziger, 1990, 1997). Contemporary child psychology tries to act as if general theory building is of no consequence for science—a standpoint that may be considered damaging to the health of any science (Crick, 1988). It is the constant movement between empirical and theoretical knowledge construction that guarantees generalizability in any science (Morgan, 1894). The thinking scientist creates new understanding while operating within the constraints of one's discipline (Knorr Cetina,1999).

It is not surprising that developmental science has been episodically linked with child psychology in its history, and that now, in the beginning of the twenty-first century, we can look at the whole world again, trying to discover within which rapidly changing society one could see developmental science getting a fresh start.

The society within which psychology exists has general worldviews and myths about itself, and the researchers demonstrate their loyalty to the given society

by implicitly accepting these assumptions. For example, the myth of the absolute goodness of Marxism as the basis for all of psychology was the guiding force in Russia during and after the 1920s (Valsiner, 1988). Aside from much ideological refuse produced, this focus also gave the world remarkably fresh ideas (such as Vygotsky's, Basov's, and Bakhtin's). Also, the concerns of high culture in the continental European traditions of the nineteenth century led to the formulations of ideas in *Ganzheitspsychologie* (Diriwächter, 2003) and Gestalt psychology (Ash, 1998). In another example, psychologists' acceptance of the value of pragmatism in the "progressive era" in the United States led to behaviorist orthodoxy (Watson, 1913).

The concentration of most of psychology in the United States in the post-World War II era might have preserved or modified some of these ideas (Valsiner, 2005a), but that was no guarantee for their development. Some aspects of the societal self-mythology led to conceptual and methodological "blinders" that might not have hindered psychology at large, but served to limit developmental science. Thus, a historian of social science remarks:

> Why, in America, was history conflated with nature? The determining factor, I believe, was the national ideology of American exceptionalism. We are inclined to think of American exceptionalism as a kind of national myth, one that began in the exalted language of the Puritan "city upon a hill" and today often degenerates into chants of "America is number one." Indeed the mythic idea of America was born in Europe, when inhabitants of what became the "old" world turned their imaginations on the "new" one. This mythic America has been given many different concrete forms: think of Martin Luther King's American Dream; or the immigrant dream of success; or the American mission to make the world safe for democracy. The background to all these versions of our national mythology, however, is a belief that America occupies an exceptional place in history. (Ross, 1993, p. 103)

Any society is exceptional in its historical uniqueness, but some were more conducive to the growth of basic ideas than others. In addition to the United States, the social-ideological adoption of Marxist dialectics in Russia in the early Soviet period was also based on a belief of exceptionalism (e.g., being chosen to build communism in a backward country). But this developmentally open philosophical stance saturated the social world—from common life to science—and created a favorable ground for cultivating developmental science.

As another example of such ideological favor, the middle-class child from the very specific cultural-historical conditions of the United States is treated as the norm, and all other children (of lower socioeconomic status as defined in the United States, or from other countries) become seen as either negatively (lagging behind) or anxiously (competitively getting ahead—Indian, Japanese, and Chinese schoolchildren in basic sciences) valued deviations. There is a short step from beliefs of exceptionalism to practices of colonialism—the quintessential Western *modus operandi* of the past 200 years. Children other than those from Euri-American middle-class background are discursively treated in ways similar to "the developing world" with all the implications that treatment involves (see Escobar, 1995).

The International Nature of Contemporary Psychology

By the beginning of the twenty-first century, contemporary developmental science became evenly distributed around the world; hence, the dependence on any single society became less relevant in this time of ideas. Now, it is the economic factors of academia that determine the nature and location of research laboratories, university departments, available academic jobs for developmental scientists, and their access to phenomena. But no single society has a monopoly on basic ideas, and their translation into empirical research practices bring new knowledge, which—if adequate—may allow for application.

At present, one of the sacred cows of psychology's socially constructed belief in objectivity is increasingly under challenge: quantification in psychology, which may be more of an analogue of accounting practices than a scientific tool.

Pathways to Objectivity

Quantification has been treated as a given in granting objectivity to psychology. Cohorts of psychology students have been trained to think that quantification is the *via regia* to science and that statistical inference is the scientific method. Quantification in psychology has become a social norm—and a professional imperative—much to the detriment of the focus on phenomena (Cairns, 1986).

Together with such social transformation comes the narrowing of the questions asking "what is knowledge" and "what is methodology." Psychology has now become an intellectual "hostage" to the "empire of chance" (Gigerenzer, 1993). Beginning from the need to study

different children, and empirically chart the ranges of existing phenomena, research practices have become dominated by canonical procedures of inductive inference, coded into a socially constructed hybrid version of statistics as "the scientific method" (Gigerenzer et al., 1989). The axioms on which statistical methods are based allow limited use in psychology (Michell, 1999).

Quantification in Context

Quantification in the process of data derivation is a sensitive operation by the researcher that cannot be accepted axiomatically but needs to be proven adequate in each case. Quantification is essentially transformation of the first level of derived data (as reflected in nominal scale, shared by both qualitative and quantitative perspectives) into a sequence of possibly more constrained levels of data quality (ordinal → interval → ratio scale—see Laird, 2005). Some complex phenomena can be irreversibly lost in the process of quantification by being turned into data that fail to represent these aspects of the phenomena that are crucial for the researcher's theoretical claims.

In any science, the decision to quantify the data—or avoid quantification—depends on the research question. Voices against excessive and automatic quantification have been quite loud all through the history of psychology. Among others, James Mark Baldwin—by the end of his life—was explicit about the reasons why quantification is a problem for developmental psychology. He proclaimed:

> The . . . quantitative method, brought over into psychology from the exact sciences, physics and chemistry, must be discarded; for its ideal consisted in reducing the more complex to the more simple, the whole into its parts, the later-evolved to the earlier-existent, thus denying or *eliminating just the factor which constituted or revealed what was truly genetic.* Newer modes of manifestation cannot be stated in atomic terms *without doing violence to the more synthetic modes* which observation reveals. (Baldwin, 1930, p. 7, emphases added)

In a retrospect from the twenty-first century, Baldwin's revolutionary call for de-quantification of psychology's methodology was precisely right. As mathematicians who look at what psychologist do often point out, the reduction of all mathematics to merely statistical methods is a serious self-limiting act of possible creativity. Furthermore, as Rudolph (2006) points out—the reality of psychological phenomena is probably not captured by real numbers. Thus, Baldwin's claim to eliminate unreflective quantification is not a crusade against mathematical rigor in psychology; in fact, it would open the door for innovations. The science of mathematics is in no way limited to statistics—which, after all, is merely a narrow area within applied mathematics. Formal models that developmental psychology may find fitting belong in the qualitative branches of mathematics (Valsiner, 1997, chap. 3). For developmental science, new inferential logics are needed—ones that work on the basis of qualitative data (Fischer & Bidell, Chapter 7, this *Handbook,* this volume). Such logics are both rigorous in their formal sides and remain adequate to the phenomena.

Statistics as a Form of Inductive Logic

The status of statistics as *one kind* of inductive logic of inference is not deniable, but it overtakes *the whole* of the scientific method when overgeneralized and constitutes a sociohistorical construction of psychology as science. Psychology's objectivity of knowledge is often equated with the use of large numbers of subjects (large *N*), "random sampling," use of "standardized methods," differences between averages (and the statistical significances of those differences), and the use of currently *en vogue* brand-name data analytic packages. Even if such characterization of received research practices is somewhat of a caricature, it refers to a large problem in psychology's methodology. Methods are increasingly segregated from theories, alienated from the phenomena they are applied to, and compared one to another as if they were opposites This can be observed in preferential value ascriptions to either quantitative or qualitative methods, or the belief in the power of standardized methods—independent of the contexts of their uses. Standardization primarily takes the form of institutional attribution of value to the method—and bypasses the issue of how the method produces data out of the original phenomena. Methods have become separate items in an eclectic toolbox of psychology from which they can be taken and applied, rather than tools that are used to craft new knowledge while carefully preserving the phenomena under study.

Data: Collected or Derived?

An alternative view on methodology considers it as a dynamic cycle in the construction of general knowledge. It entails mutually linked components of assumptions about the world at large (axioms), specific constructed

theories of the given target area, understanding of pertinent phenomena, and ways of constructing specific methods to transform some aspects of the phenomena into purposefully derived data. *Data are always constructed*—or better—*derived from phenomena,* on the basis of the investigator's reasoning (Kindermann & Valsiner, 1989; Valsiner, 2000b). The data are not collected just on the basis of the richness of phenomena but in accordance with the researcher's construction of axiomatic and theoretically relevant kinds of data.

Hypotheses Testing: Theory-Driven versus Pseudo-Empirical

The reliance on abduction in knowledge construction provides a new look at the practice of hypotheses testing in psychology. Empirical proof of a hypothesis is productive when it leads to a new idea rather than confirmation of an existing concept—which would border on pseudoempiricism:

> [P]sychological research tends to be pseudoempirical, that is, it tends to involve empirical studies of relationships which follow logically from the meanings of the concepts involved. An example would be studying whether all bachelors are really male and unmarried. (Smedslund, 1995, p. 196)

Child psychology may be vulnerable to the empirical demonstration efforts of researchers' underlying understandings of the issues because children are nonneutral objects of investigation. Furthermore, societies create expectations for normal child development, and much of the researchers' efforts are dedicated to proving that persons at the fringes of such norms are of some (special) kind (e.g., the ones at risk for some negative outcome). Pseudoempiricism can be countered by the careful elucidation of theoretical assumptions and their linkages with research questions that provide the investigator new knowledge that cannot be derived from the meanings of the terms in use.

In contrast, deductively generated (i.e., theories-based) hypotheses would highlight the role of empirical investigation for science. When a hypothesis is set within any of the following four reference frames, the empirical efforts acquire vertically consistent meaning.

Organizing Knowledge Construction: Frames of Reference

We preset our research efforts within the framework of wide general perspectives—frames of reference (Valsiner, 2000c, chap. 5). *Frames of reference* are general conceptual positioning devices within the minds of researchers who set up their research questions and construct methods to unify different levels of the methodology cycle. The same phenomenon can be studied using the different perspectives specified by the multiple reference frames. Frames of reference narrow down the focus of empirical research efforts, like the magnification levels in a microscope; while some details become observable better in selecting a particular frame, others vanish from the view.

The reference frames are necessary and needed "blinders" or theoretical general orientation tools that make focusing on our desired object possible, while eliminating distractions. Although four frames can be discerned in psychology, two of these are relevant to developmental science.

The Intra-Individual (Intra-Systemic) Reference Frame

The intra-individual frame of reference treats all issues of an individual system's (e.g., person's or society's) organization as if it is fully determined by relationships within the system. Consider an intrinsic organization of human (self-reported) personality structure such as Freud's construction of generic personality structure as involving the ideas of *id, ego,* and *superego.* These three components are located within each person, and their particular set of relationships gives rise to the immense variety of psychological phenomena of personality-in-contexts. For example, the intra-individual frame of reference separates the person from the environment, or vice versa. A study of the environment as such—not taking into account the environment's relations with the persons who inhabit it—could be equally expressed within the intra-individual frame.

The Inter-Individual (Inter-Systemic) Reference Frame

This frame involves comparison of features that are projected into the systems on the basis of external features of the projected characteristics that differ between the systems. In contrast with the intra-systemic frame, the focus here is removed from the projection itself (which is taken for granted) to the differences in the "expressions" of the projected characteristics from one system to another.

This reference frame is most widely used in psychology. It involves comparisons of individuals (e.g., "Mary

does better than Susie on test X"), or samples of subjects (e.g., males and females). It is assumed the parties compared have some characteristics inherent in themselves, *but in a different quantity* than in the others. So, comparing males and females on the characteristic of "aggressiveness" presumes that the *quality* of that characteristic is the same for men and women, but that its *quantity* may differ in some systematic way between the two genders.

The inter-individual frame of reference is widely popular in psychology—a discipline with idealized quantitative tactics of data construction—which makes comparisons between "more" and "less" "having X" cases an appealing and easy empirical research goal. Yet, such popularity is increasingly viewed as an obstacle for science (Essex & Smythe, 1999; Smyth, 2001) because it obscures a number of relevant aspects of the phenomena: their systemic organization, their stability and dynamics, and finally, their development. The use of the inter-individual reference frame guarantees that access to processes of development is denied by the very actions of the researcher.

The result of the use of this reference frame is demonstrated by the difference between the compared subjects and usually fortified by statistical safeguards to grant solidity to the finding (i.e., its replicability in the overwhelming majority of similar samples, randomly drawn). It is in the use of the inter-individual reference frame that statistical methods are adequately usable because the assumptions of this frame and those of statistics fit in a vertically consistent way (see Figure 4.1).

The inter-individual frame of reference relies on human propensity for evaluative competitive comparisons. Not only is the finding "Johnny *does better* than Jimmy in math" a statement about differences between the two children but it also simultaneously reflects the claimer's evaluative preference. Why is it assumed that having a higher score on a math test is "better" than having a lower score? This belief is encoded into our collective cultural-meaning system of seeing educational achievement as valuable.

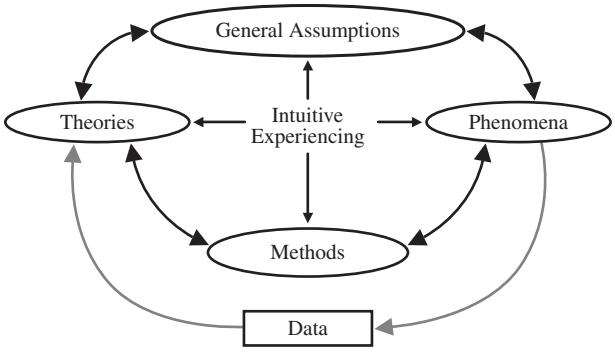


Figure 4.1 The basic structure of methodology as a cycle. *Source:* From "Changing Methodologies: A Co-Constructivist Study of Goal Orientations in Social Interactions," by A. U. Branco and J. Valsiner, 1997, *Psychology and Developing Societies, 9*(1), pp. 35–64.

The Individual-Ecological Reference Frame

The individual-ecological frame of reference considers a system (e.g., person, social group, community) that is the focus of attention of the investigator as that system acts on its environment and as the results of such action participate in the transformation of the system. This reference frame involves mutual consideration of the person and the environment and focuses on their relationship. It allows a glimpse into the goal-oriented actions of the person who acts on the environment with some future-oriented purpose (e.g., solving a problem). The action results in feedback from the changed environment on the person. That feedback participates in the change of the person into a new state.

Human development through problem-solving activities, over the whole life span, is a realistic phenomenon that can be studied through the use of individual-ecological frame. Each problem for our actions is given by some problem situation in a here-and-now setting. We set up a goal (desired solution) and try to act toward reaching that goal. The process of trying will lead to modification of ourselves; we transform due to the exchange relation with the problem situation. The goal-oriented, problem-solving effort is the context for development of the problem solver. It is not necessary to compare the problem solver with others of the kind (this was the focus of the inter-systemic reference frame), but the process of unfolding of solutions and construction of novel ones is the focus area of the individual-ecological frame.

The Individual-Socioecological Reference Frame

The individual-socioecological reference frame is an extension of the individual-ecological one. It includes *both the focus on system ⟷ environment and the role of others' social regulation of that relationship.* The developing person faces one's environment, acts on it, and transforms oneself. However, the environment is largely pre-prepared by another person (e.g., parents set up "appropriate environments" for children), and the person's

acting within an environment is socially guided in explicit and implicit ways.

The individual-socioecological reference frame thus includes the same features as the individual-ecological frame:

- An active person
- Environment
- Person's acting toward the environment

What distinguishes this frame is:

- The guiding role of somebody else acting to coordinate person environment relationships (be it another person, social institution, or a symbolic object within the environment)
- The transformation of the person as a result of this socially guided action

The researcher who adopts the individual-socioecological reference frame would study the same phenomenon that a user of the individual-ecological frame might study, yet do it differently. In the individual-socioecological frame, the researcher needs to analyze the structure of social suggestions that exist in the encounter between the person and the environment. Some of these suggestions are encoded into the environment itself, others are produced by the other persons who are active in the same environment, regulating the person's conduct in it (see elaborations in Magnusson & Stattin, Chapter 8, this *Handbook,* this volume).

Consensual Habit: Changing the Question

Very often, empirical research practices replace one frame of reference (Valsiner, 2000c, chap. 5) with another. For example, the phenomena of mother-infant mutual bonding is a relevant aspect of human relationships detectable across country, time, and context. In contrast, the abstracted use of infants' (or mothers') attachment type (A, B, C, or other) as *de facto* personality characteristics that predict some future state of the children (or mothers) shows a loss of the basic question of attachment (as a relationship that is a basis for *becoming*) and its replacement by another question (that of prediction of a future *way* of *being* on the basis of general attachment traits—the earlier way of being). What at first was a dynamic phenomenon (the process of mother and infant relating with each other to form a functional affective bond) becomes changed into a question of formal statistical relationships between two features of static being (a person "has" attachment type A, B, or C, and that predicts some "state of affairs" over time).

Translation of the research questions from dynamic and developmental ones into static ontological ones is rampant in psychology. This process happens due to the social constraints from the use of conventionalized methods and data analytic strategies in the research process. Efforts to "predict behavior" lead to the verification of essentialist stability of such behavior and its mental derivates (thoughts, beliefs, values) rather than to the investigation of the processes of behaving, thinking, believing, and valuing. As Wittgenstein pointed out years ago, a conceptual confusion reigns in psychology, resulting in the "problem and method passing one another by" (Wittgenstein, 1958, p. 232).

Methodology as an Epistemic Cycle

The components in the methodology process cycle (see Figure 4.1) are depicted as existing at different levels of generality: The axiomatic views of the world (general assumptions) are more general than theories or intuitive reflections about phenomena, and the latter is more general than the methods that generate data.

In this scheme of scientific epistemology, an emphasis is reserved for the subjectivity of the researcher who intuitively experiences phenomena in connection with his or her axioms and constructs theories from a personal standpoint. Scientists are not feelingless robots but subjective, personally involved human beings who have their subjective preferences and positions from which they look at their research.

All new models representing an object of investigation are created by subjective individuals—usually in their privacy of introspection, but at times through their immersion in the group of like-minded thinkers. Immersion in a group results in intellectual interdependency (see Valsiner & van der Veer, 2000) both among and between scientists, as well as in the societies they inhabit.

The methods and the data are constructed by the researcher on the basis of the specific structure of the process cycle. Methodology here is equal to the cyclical process of general knowledge construction, where different parts of the cycle feed into other parts. It would be appropriate to depict Figure 4.1 not merely as a cycle but also as a helix; there is never a full return to the previously generated knowledge, even if there may be outward resemblance between what is new and what is old.

Such helical development of scientific knowledge allows us to benefit from the history of ideas, a need to make sense of a basic issue (such as development) in the present leads us to look back in the history for times when similar needs were detected. An analysis of the "turns" in the nonlinear development of the helix of knowledge may allow us to avoid creating similar pitfalls in our current science.[1]

Two Kinds of Consistencies

The major role of methodology in any science is in granting consistency between the abstract/theoretical and empirical/concrete facets of the research process, keeping in close touch with the phenomena that are the object of investigation (Branco & Valsiner, 1997; Cairns, 1986; Winegar & Valsiner, 1992). Developmental psychology has been in a severe methodological crisis over recent decades because in most cases its empirical enterprise and assumed theoretical stance have not been consistent with one another (Molenaar, 2004; Molenaar, Huizenga, & Nesselroade, 2003; Smedslund, 1994; Valsiner, 1997, chap. 3). Vertical consistency between assumptions, theories, methods, data, and phenomena is necessary for valid knowledge construction. In its stead, we see many efforts to create horizontal consistency at different levels: between varied methods (standardization of fixed methods, empirical validation of methods based on other methods), between theories (clashes between proponents of theories), and between worldviews (see Figure 4.2; broken arrows denote horizontal and solid arrows show vertical consistency).

It is the vertical consistency that matters for scientific knowledge, although most of the social organization of psychology is dedicated to discussions along the lines of horizontal consistency. So, questions about the "right methods" for the study of X when answered with horizontal consistency lead to answers of either subjective evaluation (quantitative methods are "better"—or "worse"—than qualitative ones) or social censorship ("you'll never get your papers published if you use such methods"). In contrast, the same question answered with vertical consistency requires an analysis of whether the method preserves relevant aspects of the investigator's desired phenomena. For example, intelligence test items, or personality inventory items, separated from their respective "standardized methods," can be productively used to study specific questions of the cognitive processes of children (Piaget, 1922) or the adult self-construction processes (Valsiner, Diriwächter, & Sauck, 2004). The problem-solving tasks of such methods gain access to specific psychological processes; dequantification of existing quantitative methods is a promising area of research.

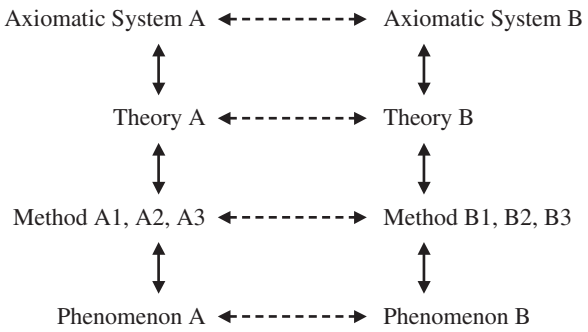


Figure 4.2 Vertical and horizontal consistency in methodology.

Objectivity through Subjectivity

The actual process of knowledge construction entails human subjectivity—for example, that of the scientist in relation to the objective reality. Science operates through the integration of empirical/inductive and theoretical/deductive lines or of "two inductions" in the terms of C. L. Morgan (Morgan, 1894, chap. 5, 2003; Valsiner, 2003a). Morgan's epistemological scheme is worth closer attention (see Figure 4.3).

The scientist (psychologist) is constantly operating on an intramental understanding—the "first induction" or "subjective induction"—of what is being studied, how to study it, and what to expect. Here the role of a philosopher and psychologist converge: Both rely on their powers of thinking to make sense of some phenomenon.

However, the scientist moves, differently from philosophers, away from such intrapsychological reflection to gain knowledge through observing others (through extrospection). The results of such observation lead to the "second induction" or "objective induction." The second induction is the process of relying on the

[1] As an example, consider our contemporary renewed interest in the brain localization of different mental functions, brought to fashion by technological advances (functional magnetic resonance imaging [fMRI]). The research questions about functional localization in the deep structures of the brain, remains similar to the question phrenologists posed—only in respect to the skull. Modern neuroscience reenacts some version of "intracranial phrenology"—thus, actually denying the science the potentially great benefits that new technology affords in principle.

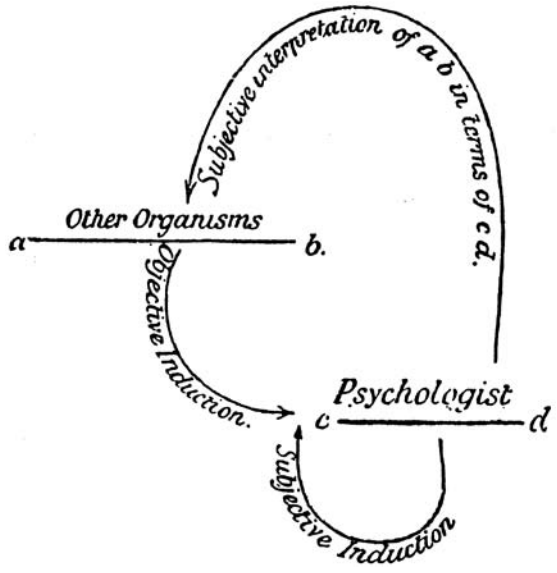


Figure 4.3 C. L. Morgan's scheme of two inductions. *Source:* From *An Introduction to Comparative Psychology,* by C. L. Morgan, 1894, London: Walter Scott.

empirical evidence emphasized in psychology. Here the scientist resembles a writer, composer, or painter—all of whom, in their own ways, rely on the experiences with the outside world to create a new form of understanding.

Knowledge Creation as Abductive Process

Without the first induction, the second induction is unable to make sense of the world; both work together. The crucial question is how the two inductions meet. Morgan's effort was to demonstrate that the unity of both inductions is necessary for scientific inference.

New knowledge emerges from the unity of inductive processes through *abduction.* Abduction is a process of creative synthesis—a qualitative "leap" of our understanding—into a new general state of knowing (Peirce, 1892, 1935). As such, scientific knowledge goes beyond the commonsense knowledge of any society rather than follow it. The conceptual frameworks of developmental science need such creative synthesis.

FOUNDATIONS OF DEVELOPMENTAL THINKING

Developmental science attempts to transcend our Western culturally structured knowledge of children. In that effort, it extends itself toward understanding human development within varied societies (comparative-cultural knowledge base—Valsiner, 2000c, 2001a), across human history (Stearns & Lewis, 1998), across life course (Brandtstädter, Chapter 10; Elder & Shanahan, Chapter 12, this *Handbook,* this volume), and across species (Matsuzawa, 2001). The interdisciplinary nature of developmental science is itself created by generalization of this knowledge.

Special Axiomatic Features of Development

The ability to maintain consistently a developmental viewpoint in child (or adult) psychology is constrained by four fundamental conditions:

1. The irreversible nature of development based on the irreversibility of time (Bergson, 1907/1911; Prigogine, 1973)
2. The complex, yet dynamic and often ill-defined, nature of the developing structure (organism, person, social network, community, etc.) and its equally dynamic and structured environment (Bronfenbrenner, 1979; Bronfenbrenner & Crouter, 1983; Bronfenbrenner & Morris, 1998; Magnusson and Stattin, Chapter 8, this *Handbook,* this volume)
3. The multilevel nature of the developing system and the environment (Gottlieb, 1992, 2003; Lerner, 1991)
4. The focus on variability in person-environment relationships as phenomenon (rather than error), and the analysis of new qualitative forms of development that emerge from these relations (Fischer & Bidell, Chapter 7; Magnusson & Stattin, Chapter 8, this *Handbook,* this volume; Molenaar et al., 2003; Valsiner, 1987, 2004a)

None of these four features of psychological phenomena are obligatory for nondevelopmental areas of psychology. Traditions in nondevelopmental psychology can succeed by ignoring both the irreversibility of time and the structure of the phenomena.

Development as Construction of New Forms

Development can be defined as the constructive transformation of form in irreversible time through the process of organism $\longleftrightarrow$ environment interchange. The emphasis on novelty construction in development is based on the basic assumption of the open-systemic nature of development (Ford & Lerner, 1992; Lerner, 1978, 1984; Valsiner, 1987). All biological, psychological, and social organisms exist and develop only because

of their permanent exchange relations with their environments. Hence, models that explain processes of development are those that either imply their dynamic interchange or take it into account in direct ways. Developmental phenomena are self-organizing systems rather than ontological objects (Allen, 1981; Jantsch, 1980).

Developmental and Nondevelopmental Perspectives

In the most general terms, nondevelopmental and developmental perspectives are opposites that deal with the same phenomena. They can be contrasted, but not eclectically mixed (Branco & Valsiner, 1997; Valsiner, 2000c). The nondevelopmental perspective is based on the axiom of identity:

$$X = [\text{is}] = X$$

Questions of development are ruled out from that axiomatic basis. In contrast, the developmental perspective is based on the *axiom of becoming,* which takes two forms:

$$X \rightarrow [\text{becomes}] \rightarrow Y$$
$$X \rightarrow [\text{remains}] \rightarrow X$$

The axiom $X \rightarrow [\text{remains}] \rightarrow X$ is not the same as the identity axiom of nondevelopmental perspectives—$X = [\text{is}] = X$. *Being* is conceptualized as an ontological entity, while *remaining,* as a process of maintaining an emerged state of the system, is implied. Both becoming and remaining are processes that guarantee both relative stability and change in development. In the case of remaining, the system maintained in its general form depends on constant innovation of the form by new parts. Biological organisms maintain themselves by both new cell production and old cell death, while the form (the structure of the organism) in general remains the same.

Multilevel Nature of Developmental Processes

Developmental science investigates transformation of structures at different levels of generality: phylogeny, cultural history, ontogenesis, and microgenesis. Each of these levels of processes are characterized by its own functional time unit; for instance, a period of 1 million years in phylogeny may be a reasonable time frame, while in cultural history 500 years may suffice. Ontogeny is limited to the maximum length of the organism's lifetime, while microgenesis may be limited to developmental transformations that occur in milli- or microseconds.

The hierarchical systems view of developmental processes is elaborated in the theory of probabilistic epigenesis (Gottlieb, 1997, 1999, 2003; Gottlieb et al., Chapter 5, this *Handbook,* this volume). In addition to the fourfold separation of the levels of organization (genetic activity, neural activity, behavior, and environment), the phenomena of human psychology require further differentiation beyond the behavioral level, through the inclusion of higher mental functions in the scheme (see Figure 4.4).

Figure 4.4 reminds us about the systemic hierarchical organization of all living systems. The issue at stake for science is not whether there are levels (a "yes" verdict is axiomatically given here), or their ontological structure (e.g., the nature of thought or affect). How many levels are posited depends on the theoretical intentions of the researcher. The levels are conceptual organizing devices that keep the researcher from assuming the unstructured field of "variables" of various kinds. Development entails the coordination of structures of functioning processes. In such hierarchical systems the notion of causality takes on a new meaning—the whole system of multilevel processes becomes the "general cause" for development. In it, the higher order levels of organization execute control over lower levels (cf. the issue of "downward causation"; Moreno & Umerez, 2000). At the same time, these "causal effects" are never linear mechanical "causal arrows," but entail negotiation between the levels of organization. Such causal processes are in effect processes of buffering between the levels.

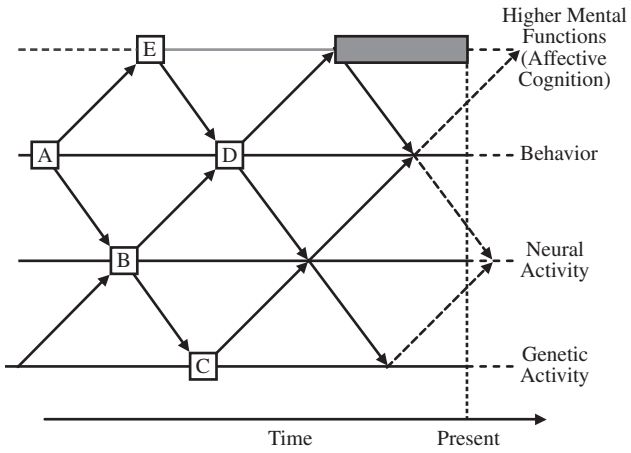


Figure 4.4 An organizational scheme of parallel processes involved in development.

However, independent of how many and which levels of organization are described by authors, the crucial feature of development of organisms remains the existence of qualitatively different levels of organization.

Dynamic Order in Hierarchical Complexity

One issue of developmental science includes how the relations between *adjacent* levels are organized.[2] Let us begin from recognizing development as a systemic, multilevel process:

> Individual human development involves *incremental and transformational processes* that, through a *flow of* interactions among current characteristics of the person and his or her current contexts, produces *a succession of* relatively enduring changes that *elaborate or increase* the diversity of the person's structural and functional characteristics and the patterns of their environmental interactions *while maintaining* coherent organization and structural-functional unity of the person as a whole. (Ford & Lerner, 1992, p. 49, emphases added)

If the previous framework is consistently put to practice in child psychology, it leads to basic reorganization of the methodology of psychology. Each of the emphasized facets of this definition indicates a need to reconceptualize child psychology's socially conventional ways of deriving the data from phenomena (Kindermann & Valsiner, 1989).

First, the *flow* of interactions between person and context leads to the necessity of utilizing time-preserving analytic units in the empirical research. Such units would be characterized by time-based description of *transformation* of the phenomenon under study in a specifiable direction. Ford and Lerner (1992, pp. 140–142) formulate *behavior episode schemata* as an example of time-based units of analysis. In repeated everyday life contexts, persons construct generalized schemata that would guide their actions in similar-looking settings, depending on their goals.

Second, the focus on *sequential transformation* calls for developing new techniques for both qualitative and quantitative analyses of complex developing systems (e.g., the use of a web metaphor—Fischer & Bidell, Chapter 7, this *Handbook,* this volume; use of a "catastrophe theory" in looking at marriage, Gottmann, Murray, Swanson, Tyson, & Swanson, 2002; use of systemic cycles in family, Stratton, 2003). A conclusive step here would be the unification of qualitative and quantitative sides of developmental transformation—something from the realm of chemical reactions (Prigogine, 1973) carried over to developmental science.

Third, the explanation of *maintenance of coherently functioning whole,* the structure that sets the stage for further development under some (but not other) circumstances, requires a basic reformulation of causality in open systems.

Psychology mixes the levels of functional organization of systems, and child psychology in its sociomoral vulnerabilities has contributed greatly to such confusion. Interestingly, it is the most biologically astute—bordering on developmental science—part of psychology, "evolutionary psychology," that has been at the forefront for creating such confusions (Crawford & Krebs, 1998; Lickliter & Honeycutt, 2003a, 2003b). Arguments within evolutionary frameworks leap over the biological, psychological, and social phenomena organizational levels, as if the world were one primordial soup in which all organisms are trying to cheat the others by gaining the upper hand for the control of resources (Strout, 2006). The environments of species are sufficiently different, even if they "share" the same habitat, that human higher psychological functions (of morality, values, and meanings) cannot be explained through evolutionary psychology unless these models honor the hierarchical—yet mutually inclusive—separation of levels of organization.[3]

DEVELOPMENTAL SYSTEMS ANALYSIS: RETHINKING MORGAN'S CANON

The emphasis on the irreversible, constructive, and hierarchically redundant nature of development necessitates clear methodological ground rules through which explanation of development is possible. The "principle of parsimony" ("Morgan's Canon") has served as the

[2] This point is relevant in the wake of abuses of the human genome discoveries—it has become tempting to link the genetic level of organization with complex psychological phenomena (e.g., claims of discovery of "the gene" for intelligence or schizophrenia).

[3] Imanishi (2002, p. 43) provides a nice comparison with grasshoppers: "Where we see a steppe, the grasshopper may see a forest." This continues the classic von Uexküll (1957) demonstration of varied perceptual inputs of different species.

constraint that has guided a number of generations of researchers toward creation of nonsystemic, elementarist causal explanations. The canonical form of Morgan's Canon is usually presented as:

> In no case may we interpret an action as the outcome of the exercise of a higher psychical faculty, if it can be interpreted as the outcome of the exercise of one which stands lower in the psychological scale. (Morgan, 1894, p. 53)

Leaving aside the selectivity of psychologists' construction of the "principle of parsimony" by borrowing this quote out of the context of the rest of Morgan's texture of thought (see Morgan, 2003; Valsiner, 2003a), it can be emphasized that this principle, as stated, effectively blocks the construction of systemic-causal explanations of development (Lerner, 1995). It forces the investigator to overlook the emergence of new regulatory mechanisms that operate *between* adjacent (i.e., both "lower" and "next higher") levels of the "psychological scale."

Developmentally, the emergence of a new regulatory mechanism (e.g., a higher-level semiotic mediating device, in the intra- or interpsychological spheres) may be initially "fragile" and ill formed. Development entails such transitional forms between levels: The higher levels are constantly in formation, yet before they are formed they cannot be clearly detected (see Figure 4.4). Hence, the canonical interpretation of Morgan's Canon makes it impossible to explain development; while development entails the emergence of hierarchically complex regulatory mechanisms (i.e., differentiation), research efforts guided by Morgan's Canon "blind" psychology's methodology to such emerging mechanisms.

This contrast may be used as an example of high-level semiotic constraining of the activities of scientists who are interested in human development. The blind spot in developmental psychology's activities is generated through a highly abstract constraint that has operated across the history of the discipline and over a varied range of specific research topics. However, it is not constructive merely to demonstrate developmental psychology's self-constraints. Existing constraints need to be adjusted to the nature of developmental phenomena.

The following reformulation could adjust the principle of parsimony to the systemic-structural conditions of development:

> If we assume development to be a multilevel probabilistically epigenetic process, in no case may we interpret an observable (i.e., emerged) outcome as being caused by a unitary lower level process (within the hierarchical network of processes), but always as a result of causal systemic processes that operate between levels. Attribution of causality to a singular-level ("higher" or "lower") causal system is possible *only and only if* we have ruled out any possible regulatory impacts from adjacent levels, especially by a process at the next higher level in the hierarchy.

This reformulation sets up a sequence of investigative activities in ways that at first require examination of the lack of between-levels ties. If such inquiry rules out such ties, then construction of causal explanations (of a systemic kind) within the given level is possible. *If* that examination *fails to rule out possible ties between levels,* then the construction of explanatory frameworks needs to retain the hierarchical (between-levels) nature of the phenomena under study, at least to the next immediate level of hierarchy.

As an example, consider Figure 4.4. The modified "canon" requires that to consider explanations for transformation A $\rightarrow$ D at the behavioral level only; it has to be proven first that neither the higher level (E) nor the lower level (B) phenomena are involved within the causal system. Inferences of causality that bypass the involved intermediary levels in linear causal terms (e.g., A causes C; see Figure 4.4) are inadmissible. Yet, *through* the system A $\rightarrow$ B $\rightarrow$ C, the actual role of A in transforming C may exist. Biological and psychological systems operate by systemic causality models in which catalytic processes are of special relevance.

Systemic Causality in the Biological and Psychological Worlds

Psychologists are used to thinking of the analysis of variance, in which the attribution of causes goes to "main effects" and "interactions," without much further thought about what the nature of such inductively derived "causes" is. This may, for some time, suffice in nondevelopmental psychology, but it fails in its developmental counterpart. The study of development cannot productively make use of linear models of causality (X causes Y or X causes Y given Z; see Valsiner, 1987, 2000c) and is in need of assuming systemic ones (e.g., system A-B-C leads to Y or system A-B-C given catalytic conditions P-Q leads to Y). These systemic versions of causality entail researchers' focus on cyclical systemic processes that lead to "caused outcomes" mostly as by-products of the self-regenerating (main-

taining) activity of the causal system. In this respect, causality in development can be taken to be reciprocal or mutual (Ford & Lerner, 1992, pp. 56–58; Lewin, 1943; Weiss, 1969, 1978). Such cyclical models are normal assumptions in biology (e.g., the "Krebs cycle," Krebs, 1964) but are rare in psychology.

Psychological Synthesis

Causal systems in biological and social sciences are systemic and catalytic. The system doing the causing has to maintain itself in the course of existing. A general scheme of that process is presented in Figure 4.5 (Minch, 1998, p. 47).

The process of synthesizing two separate substrates (*A, B*) into a new compound (*AB*) is made possible through a catalyst (*C*) which temporarily binds to the input substrates: first to *A* (arriving at intermediate compound *C-A*), then to *B* (arriving at intermediate compound *C-A-B*—binding *A* and *B* into one whole). The catalyst then releases the newly synthesized compound *A-B* and re-creates itself (*C*). Without the binding role of the catalyst, the synthesis need not be possible (direct, unmediated synthesis $A + B \rightarrow A\text{-}B$ cannot proceed). The making of a new compound—a new whole—is set up.

This generic example of catalytic process illustrates the difference between organismic and classic formal causality models in scientists' thinking. The same picture depicted in Figure 4.5 would be easily explained away by a statement, "*C* causes the emergence of *A-B*" (e.g., "poverty causes children's violence," or, if researchers avoid direct causal language, use "poverty predicts children's violence"). As we see from Figure 4.5, such general statements are insufficient, even if in some abstract sense true (indeed, the cycle of transformation of *C* into *C* through *C-A* and *C-A-B* can be said to "cause" *A-B*). Surely, such abstracted statements can operate as mentally economical shorthand in scientists' interactions by implying the whole set of known processes in the system; one does not need to repeat them verbatim.

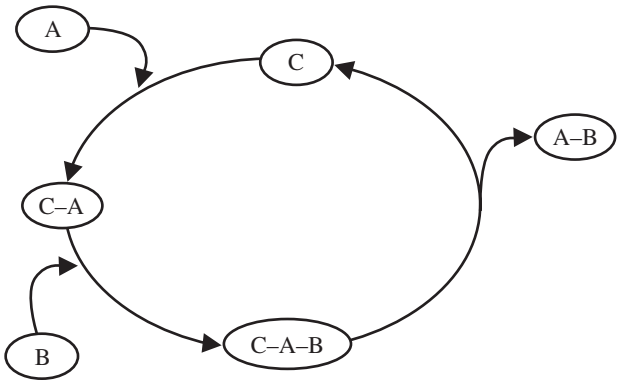


Figure 4.5 An example of a systemic causal model. C is a catalyst that makes it possible to synthesize A and B, while reproducing itself in a cycle.

Autopoietic Systems and Generation of Novelty

Figure 4.5 tells us a story of a system maintaining itself, while generating a composite (*A-B*). Developmental science needs to go beyond maintenance of synthesis to explain the synthesis of the novel and unexpected. Developmental systems need to be viewed not only as reverberating in their established regenerative cycles but also as autopoietic in their nature (Maturana, 1980).

Under certain conditions, the causal systems innovate themselves by constructing a new part to be incorporated into themselves or by reorganizing the processes that unite the parts within the system. This possibility creates a specific condition for the study of development, as it renders it impossible to infer from the outcomes of some developmental process anything about the causal system that produces the outcome. If a new outcome A-B-*D* (in terms of Figure 4.5) can be detected, it is not possible to infer that the previously proven causal system (A + B mediated by C) has produced it. There is a possibility that the causal system has modified itself (see also Figure 4.6). The structure of

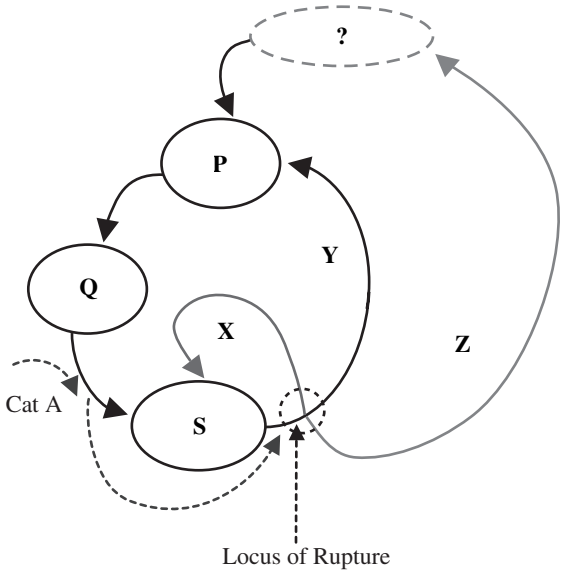


Figure 4.6 The intransitive hierarchy and its innovating rupture.

the "causal cycle" may have been altered, given the detection of the outcome such as a new by-product.

At first, it is necessary to prove that this new outcome could not emerge from the functioning of the previous system. The very same outcome in development can be reached (or maintained) via different causal systems (i.e., the *equifinality principle* that is characteristic of all open systems), and different outcomes can be generated by the same causal system. This theoretical aspect of development has been noted as a complicating issue for empirical research practices (Baltes & Nesselroade, 1973) and has particular repercussions for human development (Bornstein, 1995; Kojima, 1995). The equifinality principle leads to new methods of sampling (e.g., historically structured sampling).

Dynamic Hierarchies in Developmental Processes

Hierarchies are used by different thinkers who construct models of child development that are ill defined and ideologically flavored concepts. The ideological connotation seems to be a transfer from societal models (e.g., of citizens' equality, in terms of political freedoms) in a Western democratic society. Given these connotations, the use of hierarchy concepts in differentiation models is often tentative, as there is the understanding that the usual view of hierarchy—that of a "top-down" strict control process—may be limiting (see Ford & Lerner, 1992, p. 114).

However, hierarchies can be of different kinds and stability. Hence, the use of differentiation models need not signify a reduction of the flexibility of the developmental process to some strict scheme. Any hierarchic organization can be viewed as a temporary construction (which vanishes as soon as its control function is no longer necessary). Nor are hierarchies necessarily strict in their logic.

Transitive and Intransitive Relations

Any hierarchical relationship can be of two possible general kinds: *linear hierarchy,* which is based on the logical relation of *transitivity* (i.e., if A $\longleftrightarrow\!\!\!\!\!\rightarrow$ B and B $\longleftrightarrow\!\!\!\!\!\rightarrow$ C then A $\longleftrightarrow\!\!\!\!\!\rightarrow$ C, where $\longleftrightarrow\!\!\!\!\!\rightarrow$ indicates a dominance relation in an otherwise mutual relationship); or *cyclical hierarchy,* which is based on intransitive relations (see Figure 4.5; e.g., A $\longleftrightarrow\!\!\!\!\!\rightarrow$ B and B $\longleftrightarrow\!\!\!\!\!\rightarrow$ C and C $\longleftrightarrow\!\!\!\!\!\rightarrow$ A). For example, if a dominance hierarchy is presumed, it is assumed to remain stable and fixed. This is a clearly nondevelopmental view; it may be a formal model for nonliving objects but not for organisms. Interestingly, the fixed intransitive hierarchy also guarantees the stability of the system.

Figure 4.6 illustrates the functioning of an intransitive hierarchy and locates the place for potential developmental transition. Usually, when "hierarchy" as a term is used in psychology, it is the first level of hierarchy—based on transitivity—that is being considered. For example, most of the interpretations of Werner's hierarchical integration concept (except his own—see the following) have assumed the linear (transitive) fixation of the emerging differentiation.

In contrast, a case of intransitive hierarchy could be the case for flexible hierarchical control processes between the levels of integrated structure. It is the second kind of hierarchy, based on intransitivities, that dominate the regulatory processes in the biological and psychological worlds. Most of the biological regulatory processes are of a cyclical structure. In both hierarchies, plasticity is embedded in the possibility that change in any relationships can proliferate change in the whole structure (e.g., Lerner, 1984). Yet, the intransitive hierarchies are themselves not yet open to development; in fact, such hierarchy preserves the status quo through fluctuation of the context-dependent kind (see Figure 4.6).

We reach here a major epistemological generalization about what the theories of *causality* or *relationships* mean in psychological and biological systems. Instead of the usual acceptance of *linear direct* causality models (A causes B; see Valsiner, 2000c, p. 74), an appropriate model of causality is a *systemic catalyzed* approach (system A-B-C results in X if catalytic condition Z is present). Such understanding has productively been put into place in biochemistry (Krebs, 1964). From that viewpoint, mere discovery of statistical "relationships" between variable X and variable Y in a correlational analysis reveals little about the actual functioning of the system in which X and Y are systemically linked. Correlational data do not explain—they need explanation themselves!

The move to the use of systemic catalyzed causality models replaces our focus of analysis from the structure of the system as it is (once the structure is described) to that of under what conditions that system might be modified. This focus is nothing new in science: In 1927, Kurt Lewin emphasized the conditional-genetic nature of unitary complex phenomena (*konditional-genetische*

Zusammenhänge—p. 403) where, through the study of varied conditions of functioning (*Bedingungsstruktur*) of the system, its potentials for transformation into a new state—as well as conditions of its breakdown—could be revealed. Vygotsky's use of the same epistemological mind-set led him to elaborate the "method of double stimulation" as the methodological tool for developmental psychology (see Figure 4.9; also Valsiner, 2000c, pp. 78–81).

Intransitive Hierarchies in Real Life

We are not merely building abstract theoretical models here. The intransitive hierarchy may be a tool for thought that allows us to understand seemingly paradoxical unities of seemingly opposite phenomena in psychological phenomena.

As an example, consider a frequent question on the minds of sociologists and psychologists concerning dominance relations between genders. Much of the passion of ordinary human beings has been devoted to movements for liberation—for example, equality for women in many worlds. Seemingly paradoxical findings come out of efforts to look into these women's worlds (Villenas & Moreno, 2001). What is implied in these movements is the idea of intransitive hierarchy (see Figure 4.6) and its desired reversal (male dominance over females becomes equality, which means women's dominance over men, given the centrality of women in reproduction of the species, Rogers, 1975). Furthermore, anthropologists going to do their work in non-Western societies may find the gender relations far more complex than the simple label of "dominant over . . ." can cover. Meigs (1990) found in Hua males in New Guinea Highlands three parallel gender ideologies: one, male-chauvinistic; the second, subdominant and envious of female reproductive power; and the third, egalitarian. Movement between these three ideologies may be an example of a cyclical intransitive hierarchy where males may be dominant over females who are dominant over males, and so on.

Notice that such context-specific prioritizing of parts of a cyclical whole creates a system of high variation that is dynamically stable. Change is rampant in this system; yet, development is not. The question then stands: In what hierarchical order could development emerge? Clearly the transitive hierarchy is out of the question because of its fixity, but so is the regular intransitive hierarchy (see Figure 4.6 where trajectory X prevails). It is easy to see how blocking of the cycle (trajectory Y) turns the intransitive hierarchy into a transitive one. It is only the case where a rupture of the cycle—a new transformation of the system—opens up the creation of a new part of it (trajectory Z).

Evidence for such self-organized emergence of novelty is present in the genetic regulation of viruses. The genome of *Coccolithovirus,* for example, includes its own regulatory machinery for changing the basic structure of the genome under specific catalytic conditions of the environment (Wilson et al., 2005). This is an empirical illustration of the catalyzed rupture of the previous intransitivity cycle—albeit at the level of genome regulation. In the psychological realm, similar ruptures in the existing intransitivity cycles operate at the level of emergence of new sign hierarchies (Valsiner, 2001b; Zittoun, 2005).

Variability Is the Phenomenon and Not an "Error"

Variability, both within a system over time and between systems, is crucial for any understanding of development (Molenaar, 2004); hence, the trajectories described at the data level form families of similar trajectories. To arrive at such family descriptions, the individual case—individual trajectory of development—is the crucial feature of the data. Generalizations in this perspective are made from single cases to the generic functioning of the personality system (Lamiell, 2003). The empirical task of the researcher is first to analyze the systemic functioning of the single systemic case, and once the single case is explained, then to aggregate knowledge of the ways in which the system works, across persons into a generic model (Molenaar et al., 2003; Thorngate, 1986, 1992).

Contemporary psychology is used to the discourse about "individual differences," which at first glance seems to be about variability. Yet, this is not the case; talk about "individual differences" is about the description of quantitative deviations from some anchor point (the average, or any other criterion) and its usual utilization is for the purpose of not recognizing variability that exists within phenomena (Valsiner, 1986). Technically, having evidence about individual differences makes it possible to make statements about "relationships between variables," which as qualities are not considered to differ. A correlation coefficient found to represent a relationship between X and Y reifies the assumed lack of variability of X or Y and emphasizes their qualitative homogeneity. In contrast, a view of the scatter plot of

the data from which the correlation coefficient is derived retains the evidence for variability.

The talk about "individual differences" is imprecise, as in reality there are two "individual differences": (1) those within the system over time (intra-individual differences) and (2) those between systems at the same time (inter-individual differences). Furthermore, it has been proven that the two differences are not isomorphic (Molenaar et al., 2003). This leads to a need for a radical innovation of empirical research strategies. Reliance on the averages or prototypes and modeling developmental phenomena with the assumptions of the "general linear model" need to be abandoned as misfitting with the realities of systemic phenomena in psychology, especially of developmental phenomena.

The Intra-Systemic Variability

Developmental science separates this variability—fluctuations of the system <> environment relations over time—from the study of samples. Intra-systemic variability is observable only by repeated observations of the system and can be investigated either quantitatively (Nesselroade & Molenaar, 2003) or qualitatively (Mey, 2005). It is characterized by the parameters of the study of individual lives (C. Bühler, 1934): The description of the life course in relation to the environmental conditions (e.g., Chernoff, 2003; Mernissi, 1994; Shostak, 1981). Each life course is unique in its details, and that uniqueness is knowable by comparing its subsequent forms with the previous ones. Yet, behind such maximum uniqueness of the person over time can be universal life course features, invariants that can be discovered by abstracting and generalizing from such individual courses. The study of intra-systemic variability can include both unique "local description" and the finding of universal principles from comparisons of the life courses.

The Inter-Systemic Variability

As Molenaar et al. (2003) have demonstrated, the variability encountered between systems (in a sample drawn from some larger unit called "population") is not, and cannot in principle be, isomorphic with the intra-systemic one. This finding renders the study of groups of people—samples—irrelevant for creating scientific knowledge about general principles that are applicable at the individual level. A generic model that emerges from an analysis of samples is not applicable to individuals in the sample (except for the boundary case—which is practically impossible—of complete homogeneity of the sample).

In what ways can inter-individual variability be productive material for developmental science? It can provide a basic background: The whole set of available examples (i.e., inter-individual variability or the sample of individual cases) is the basis for *selection of specific cases* on which a proposed model is tested intra-systemically. If the hypothesized generic model of the single case (e.g., drawn from the middle range of the sample distribution) is demonstrated to function in the cases who are "outlayers" in the distribution, the researcher is on his or her way toward basic knowledge (Valsiner, 2003b). This strategy is well known in linguistics, where adequacy of a theoretical proposition is tested on singular examples from language, testing for extreme cases that may refute the proposition. Finding of such single counter-cases forces the theoretical system to reconstruct, or at times may lead to the abandonment of, the system.

Sampling Reconsidered: Historically Structured Sampling

The refocusing of developmental methodology from samples to the systemic study of individual cases and generalization from these sets up sampling in a novel light (Sato, Yasuda, & Kido, 2004). Developmental systems are characterized not by their states of being but their processes of becoming. Their individually unique trajectories may converge temporarily at some time point (*equifinality point*), only to diverge later.

Under the traditions of sampling—selecting individual cases creates a sample to represent a "population"—the focus has usually been on random sampling. It is assumed that randomness of sampling guarantees the best version of representation. In contemporary social sciences, we find a new tradition of experience-based sampling (Csikszentmihalyi & Larson, 1987; Kubey & Csikszentmihalyi, 1981). This emphasis grew out of taking specific pointed samples of everyday life experiences and accumulating those over time. The result, however, is not qualitatively different from the sampling persons, only here we have a "population of experiences" of a person, over time (i.e., such sampling verifies the intra-individual variability).

If we are interested in constructively combining the inter-individual and intra-individual forms of variability for the sake of arriving at generalizations within idiographic science, the idea of sampling acquires new

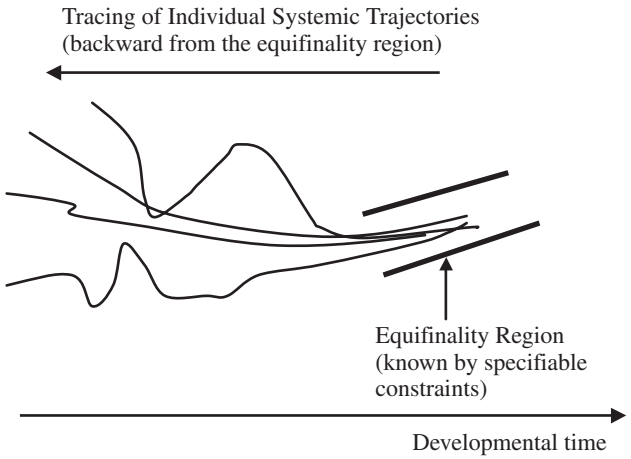


Figure 4.7 Sampling of developmental trajectories based on the equifinality point (region)—HSS or Historically Structured Sampling. *Source:* From "Whom to Study in Cultural Psychology: From Random to Historically Structured Sampling," by J. Valsiner and T. Sato, in *Pursuit of Meaning: Theoretical and Methodological Advances Cultural and Cross-Cultural Psychology,* J. Straub, C. Kölbl, D. Weidemann, and B. Zielke (Eds.), 2006, Bielefeld, Germany: Transcript.

meaning. We can speak of equifinality point sampling, or, more generally, about historically structured sampling (HSS; Valsiner, & Sato, 2006). Because the research question in developmental science is not to characterize intrinsic general properties of the systems, but rather to understand their functioning in the process of their relating with their environments, it is the question of what is general in the variety of trajectories converging to the same temporary equifinality point. Furthermore, developmental phenomena are historical in their nature; particular systems converge at the equifinality region under different circumstances. The HSS considers precisely that variety of circumstances; beginning from the specified equifinality region, it traces individuals backward in their history to varied antecedents (see Figure 4.7).

CENTRALITY OF FUNCTIONAL STRUCTURING

The terms *form* (or structure) and *function,* as well as *construction,* and *transformation,* are of key relevance for models of development. Usually, we see these two pairs of concepts as if they were opposites: Structure is viewed as static (and function as dynamic) and transformation merely changes in pre-given ways (rather than by construction of novelty). Yet, the organisms that develop unite the two sides: They are structurally organized (which makes it possible to support different functions), and they transform themselves through construction of novel structure (Guerra, 2003; Slunecko, 2002).

Each term has been disputed frequently by those with opposing axioms. Thus, the basic "battle" between European Gestalt (and *Ganzheit*) psychology, on the one hand (Ash, 1998; Diriwächter, 2003, 2004), and American associationism, on the other, has framed much of the history of developmental psychology (Cairns, 1998). This battle never ended—nor could it—because the difference between axiomatics (structure versus structure as reducible to elements) is in itself a matter of assumptions, not of truth. Likewise, organisms constructing their own development—that is, active creation of novelty—is of an axiomatic nature.

This very general idea of development of structures is well rooted in the history of developmental biology and psychology. Its roots are obviously in the *Naturphilosophie* of the eighteenth and nineteenth centuries and can be traced to Johann Wolfgang Goethe's ideas about biology. By the end of the nineteenth century, the focus on development was a widely recognized central topic in psychology, so its conceptualization was not foreign to well-known thinkers whose role in developmental psychology is usually not emphasized, such as Wilhelm Wundt, Franz Brentano, George H. Mead, Georg Simmel, and others.

The question that arose—then and now (e.g., Rogoff, 2003, pp. 52–62; see also Budwig, Valsiner, & Bamberg, 1998)—was the unit of analysis of complex developmental phenomena. In the beginning of the twentieth century, the question of the different organizational levels of quality was part of general discussion. The phenomenological basis for much of that discussion was the ordinary feature of the lives of philosophers and psychologists of the time—making music, and listening to it (live—the era of CDs was yet to come!):

> The starting point of the theory of Gestalt qualities was the attempt to answer a question: what is melody? The most obvious answer: the sum of the individual tones which make up the melody. But opposed to this is the fact that the same melody may be made up of quite different groups of tones, as happens when the same melody is transposed into different keys. If the melody were nothing other than the sum of the tones. Then we would have to have here different melodies, since different groups of tones are involved. (von Ehrenfels, 1932/1988, p. 121)

Centrality of Transfer and (Synthetic) Units of Analysis

The "whole" issue of development is that of structural transposition: from one context to another, and from one form of a structure to an altered (developed, progressed, or regressed) form. The developmental thinkers of the beginning of the twentieth century attempted to make sense of the whole-part relations in different ways, through abduction (C. S. Peirce), creative synthesis (W. Wundt), or "vertical" transfer of experience from one context to another via generalization. The "whole" was to be studied as a living form, a structure, that cannot be understood without the constant dynamically interacting parts, essential to life, stemming from present as well as past (Krueger, 1915, pp. 166–171).

This holistic look at the unit of analysis led Lev Vygotsky (1927/1982) to formulate the dialectical systemic unit of analysis:

> Psychology, as it desires to study complex wholes . . . needs to change the methods of analysis into elements by the analytic method that reveals the parts of the unit [literally: breaks the whole into linked units—*metod . . . analiza, . . . razchleniayushego na edinitsy*]. It has to find the further undividable, surviving features that are characteristic of the given whole as a unity—*units within which in mutually opposing ways these features are represented* [Russian: *edinitsy, v kotorykh v protivopolozhnom vide predstavleny eti svoistva*].[4] (p. 16, my elaboration of translation)

Such generalization arises through the formal operations the researchers perform on the phenomena to make sense of them. Its root metaphor has been the contrast between water and its components (oxygen and hydrogen).[5] Quite obviously the properties of water are not reducible to those of either hydrogen or oxygen. Yet, water remains universal in its chemical composition independent of whatever biological system (e.g., human body, cellular structure of a plant) or geological formation (e.g., an ocean, or a coffee cup!) in which it exists.

The focus on holistic units of analysis leads to the need of recognition of the existence of different organizational levels within any developing system and the maintenance of these levels in our efforts to explain phenomena through appealing but far-off (in terms of neighborhoods of levels) causal mechanisms. As Kenji Imanishi (2002, p. 22) wittily remarked, "[It] is nonsense to explain why birds fly and fish swim in terms of cells which cannot fly or swim." The explanation can come from an organizational level that synthesizes the work of cells—some form of network of cells in the nervous system, providing the basis for the swimming and flying. Yet, such a network includes cells as parts, not as causes. Causality is in the functioning of the system—the network of cells—not in the individual components of the whole. The reduction of causality for complex phenomena to the elementary components of the phenomena creates confusion, not clarity. This becomes particularly visible when the contemporary fascination with the human genome project leads to claims about locating "the gene" for some complex human phenomena (be it schizophrenia, school performance, or any other "dependent variable") in the vast number of base pairs. Actual evidence of genetic regulation demonstrates that such simple one-to-one connections are biologically impossible—as those traverse the multiple organizational levels of the system. Yet psychologists' (and laypersons') minds continue their search for simple ways to attribute causality—or blame—to rhetorically socially accepted simple "causes." Child psychology seems still far from abandoning the conceptual impasse "the nature *or* nurture" problem.

CONSTRUCTING GENERAL MODELS FOR DEVELOPMENTAL SCIENCE

The selection of models for closer historical and conceptual scrutiny was guided by their axiomatic assumptions. There are two basic parameters for the selection: *reliance on dynamic restructuring* over time (differentiation, de-differentiation, and integration), and *focus on the interchange with nonrandom, structured, and goal-oriented guiding environments.*

[4] It is important to note that the intricate link with the dialectical dynamicity of the units—present in the Russian original—is lost in the English translation, which briefly stated the main point: "Psychology, which aims at a study of complex holistic systems, must replace the method of analysis into elements with the method of analysis into units" (Vygotsky, 1986, p. 5).

[5] This metaphor has been used in scientific discourse since the time of J. S. Mill: "Not a trace of the properties of hydrogen or of oxygen is observable in those of their compound, water" (R. Keith Sawyer, personal communication, February 20, 2002).

It is obvious that these two classes of models utilize the two frames of reference appropriate for developmental analysis: the individual-ecological and the individual-socioecological frames. The first class of models includes those that assume differentiation and equilibration. The second class concentrates on relations with the guiding environments. All of the models are structuralist in their basis (yet allowing for dynamics) and are historically rooted in developmental biology (rather than psychology) as well as in philosophies that have emerged on the basis of biological worldviews.

Differentiation and Equilibration: Dynamics of Structures

Any conceptual model of development that entails the core of a previous state of the developing organism (X) becoming transformed into a reorganized structure (X—Y), and/or becoming transformed from more articulated (plural) systemic forms to a singular one can be considered to belong to "differentiation models." Theoretical discourse that focuses on *something-becoming-something else* is called *genetic* or *co-genetic logic* (Baldwin, 1906; Herbst, 1995). Formalization of such developmental logic has been in its infancy during the twentieth century. Nevertheless, any differentiation model implies some (usually not explicated) form of logic of change in irreversible time.

The image of differentiation—growth of structure over time—is certainly a very easy thought model to assume for any naturalist who looks at the growth processes in nature. The history of differentiation models can be traced back to the view on nature propagated by Goethe, and certainly to the traditions of *Naturphilosophie*. It is from that background that the founder of embryology, Karl Ernst von Baer, fit differentiation with his observations of the ontogeny of organ systems (von Baer, 1828). The integrated nature of differentiated organ systems was a given for a natural scientist, and there is never a need to reiterate that it is only the organized biological system (rather than its components) that lives. The focus on differentiation was slightly more complicated in the development of evolutionary thought (Gottlieb, 1992; Oyama, 1985).

We can elaborate the general nature of the differentiation models further. If the transformation of structure in the direction of greater systemic complexity (i.e., $X \rightarrow \{X—Y\}$ transformation) can be conveniently referred to as progression, then its reversal (i.e., transformation of $\{X—Y\} \rightarrow X$) may refer to regression. Regression is included in the differentiation models. For the sake of completeness, we should speak of *differentiation and de-differentiation* models, following the lead of Kurt Goldstein (1933, p. 437). It is important to reiterate that any process of de-differentiation (often subsumed under the label "regression," which implies a return to a previous state) is a part of an *ongoing* process of development. Any "return" to a previous state is ruled out by the irreversibility of time, which renders every new developmental state to be unique. However, states that can be viewed as *similar* (see Sovran, 1992) to previous ones can be detected when we study human life courses. Development can be conceptualized graphically as a helix that is unfolding in irreversible time. At different parts of the curves of the helix, a new state can resemble a previous state; yet, a new state never repeats a preceding one.

Numerous examples of differentiation models have been used in different areas of child psychology. These models have emerged on the basis of biological (Sewertzoff, 1929; von Baer, 1828) and linguistic (its diachronic focus, à la Saussure—Engler, 1968) research targets. In the studies on child language development, we encounter descriptions of how children's recognition or production of phonemes or words is transformed in ontogeny. Stage models of cognitive development indicate differentiation of cognitive structures (Case, 1985; Fischer, 1980; Fischer, Yan, & Stewart, 2003), and microgenetic analyses of children's mental operations reveal transformation of problem-solving strategies with age (Valsiner & van der Veer, 2000, chap. 7). Despite their wide *de facto* usage, general axiomatic formulations have been rare in developmental psychology.

James Mark Baldwin and the Developmental Logic (Genetic Logic)

Baldwin's work has been seminal in various aspects of developmental psychology (Valsiner & van der Veer, 2000). His role in the elaboration of the differentiation models was equally profound, as it took place in the context of his creation of the ideas of "genetic logic" or "logic for development" (Baldwin, 1906). This logic for development has to take into account the open-endedness of the developmental process: how novel forms may emerge at some junction, given a previously existing structure and its current relation with the environment. The organism is active within its environment

through a process of constant experimentation, trying and trying again (engaging in "persistent imitation"), which leads to the differentiation of the environment and intrapsychological world.

Heterogeneity of Experiences

Baldwin clearly understood the theoretical dangers of viewing the organism's environment in terms of its static features. The world of the developing person is variable. That variability takes realistic forms, which entail social interaction:

> [T]he child begins to learn in addition the fact that persons are in a measure individual in their treatment of him, and hence that individuality has elements of uncertainty or *irregularity* about it. This growing sense is very clear to one who watches an infant in its 2nd half-year. Sometimes the mother gives a biscuit, but sometimes she does not. Sometimes the father smiles and tosses the child; sometimes he does not. And the child looks for signs of these varying moods and methods of treatment. Its new pains of disappointment arise directly on the basis of that former sense of regular personal presence upon which its expectancy went forth. (Baldwin, 1894, p. 277)

From such heterogeneity of the person's social environment follows the need for selective treatment of that heterogeneity by the person. The previously established "schema" (see Baldwin, 1908, p. 184) allows the person to become selective as to the variety of actual environmental inputs. According to Baldwin (1898), the person:

> becomes a law unto himself, exercises his private judgment, fights his own battles for truth, shows the virtue of independence and the vice of obstinacy. But he has learned to do it by the selective control of his social environment, *and in this judgment he has just a sense of this social outcome.* (pp. 19–20)

It is obvious that the social nature of a person is expressed in his personal individuality. That individuality becomes differentiated from its social roots and acquires relative autonomy. Mere slavish mirroring of the social world is rendered impossible by the heterogeneity of the autonomy, which triggers the need for "systematic determination" of new knowledge by way of *internalized* selection mechanisms that operate within mental processes: cognitive schemata (Baldwin, 1898, p. 10). Such schemata—not as *re*presentations of the world but as anticipatory *preorganizers* of the person's future encounters with the world—continued in the work of Frederick Bartlett (Rosa, 1993), Jean Piaget (Chapman, 1988, 1992), and Lev Vygotsky (van der Veer & Valsiner, 1991). Thus, the relevance of presently emerging differentiated structures of thought or action was to provide a basis for future encounters with ever-unpredictable environments.

Pierre Janet and the Hierarchy of Psychological Functions

Perhaps the most central figure for the development of psychological thought in the first decades of the twentieth century was the shy French psychiatrist Pierre Janet (Valsiner & van der Veer, 2000, chap. 3). He was the originator of the analysis of subconscious processes. Janet's work was the basis for various activity theories that have proliferated in this century (Boesch, 1983, 1991; Leont'ev, 1981).

Janet's main focus was on the demonstration of differentiation of thinking and acting phenomena in the structure of personality and demonstration of their mutual integration (Janet, 1889, 1926, 1928). In the process of differentiation, some parts of the functional system establish their role as regulators over the others. Different clinical cases provide evidence for hierarchical control of the normal functioning of the mind by way of pathological excesses that can be obtained by simple alteration of the control system. On the one extreme, one can find the complete blocking of concrete action by way of thought processes (Janet, 1921). On the other extreme, it is possible to find thought processes that automatically are triggered by perceptual experiences and lead to uncritical and unchecked execution of actions (Janet, 1925, p. 210).

The Concept of Tension

The ways in which persons handle the differentiation and integration of their personality systems are certainly highly variable. The concept of *psychological tension* is present at all levels of Janet's thought-action hierarchy (Sjövall, 1967, pp. 52–56). At the higher level of that hierarchy, the phenomena of personal *will* can be observed as the highest control mechanisms. Thus, will is not a mystical entity outside of the regular action-control hierarchy in opposition to it; rather, it is the highest level of the hierarchical system, which emerges through development.

The process of differentiation is characterized by tension between parts of the previously differentiated

structure. This tension leads to focusing of the psychological work on them, so that:

> The patients who are ill-satisfied with their action watch themselves and by dint of observations, through anxiety about themselves, they fall into a sort of perpetual autoanalysis. They become psychologists; which is in its way a disease of the mind. (Janet, 1921, p. 152)

The crucial feature of handling such tensions is the *personal synthesis* of past experiences in the present through the use of language (Meyerson, 1947). Similar emphases on processes of fusion versus differentiation can be found in the work of Henri Wallon (1942, 1945).

Heinz Werner's Differentiation Model

Heinz Werner was, together with Jean Piaget and Lev Vygotsky, one of the three key developmental scientists of the twentieth century. Analyses of his work have been well represented in this *Handbook* in the past (Langer, 1970; Valsiner, 1998a) and have been given recent attention, which unearthed a number of unknown intellectual interdependencies between the scientist and his social setting (Valsiner, 2005a).

The Orthogenetic Principle

For English-language psychology, the general version of Werner's view is a quote from his presentation at the first Minnesota Symposium on Child Development. It is usually presented as:

> Developmental psychology postulates one regulative principle of development; it is an orthogenetic principle which states that wherever development occurs it proceeds from a state of relative globality and lack of differentiation to a state of increasing differentiation, articulation, and hierarchical integration. (Werner, 1957, p. 126)

The origin of differentiation goes back to Goethe (cf. Werner, 1926, p. 32). To understand Werner's intentions, it is his elaboration of the idea that needs to be considered. It is important to emphasize Werner's focus on the emergence of the polarity (differentiation) of the "subject" and its "object":

> [I]ncreasing subject-object differentiation involves the corollary that the organism becomes increasingly less dominated by the immediate concrete situation; the person is less stimulus-bound and less impelled by his own alternative states. A consequence of this freedom is the clearer understanding of goals, the possibility of employing substitutive means and alternative ends. There is hence a greater capacity for delay and planned action. The person is better able to exercise choice and willfully rearrange a situation. In short, he can manipulate the environment rather than passively respond to the environment. This freedom from the domination of the immediate situation also permits a more accurate assessment of others. (Werner, 1957, p. 127)

The orthogenetic law was not meant to be a unilinearity prescribing principle at the level of concrete developmental phenomena. In actuality, Werner recognized the multilinearity of developmental trajectories (Werner, 1957, p. 137). Differentiation included de-differentiation as its complementary part. The process of hierarchical integration involved qualitative reorganization of the "lower" (i.e., previously established) levels of organization, when the higher levels emerged in their specificity:

> [D]evelopment . . . tends toward stabilization. Once a certain stable level of integration is reached, the possibility of further development must depend on whether or not the behavioral patterns have become so automatized that they cannot take part in reorganization. . . . The individual, for instance, builds up sensorimotor schemata . . . these are the goal of early learning at first, but later on become instruments or apparatuses for handling the environment. Since no two situations in which an organism finds itself are alike, the usefulness of these schemata in adaptive behavior will depend on their stability as well as on their variability (which is a case of paradoxical "stable flexibility").
>
> . . . if one assumes that the emergence of higher levels of operations involves hierarchic integration, it follows that lower-level operations will have to be reorganized in terms of their functional nature so that they become subservient to higher functioning. A clear example of this is the change of the functional nature of imagery from a stage where images serve only memory, fantasy, and concrete conceptualization, to a stage where images have been transformed to schematic symbols of abstract concepts and thought. (Werner, 1957, pp. 139–140)

Werner's perspective on subject-object differentiation consistently led to psychological mediating devices emerging as human-made organizers of the mental and affective processes. In this, there existed a clear parallel with Lev Vygotsky's emphasis on semiotic mediating devices (see van der Veer & Valsiner, 1991). In Werner's

terms, these mediating devices emerge in the differentiation process and lead to planful behavior and specifically personal motivation (Werner, 1940, p. 191).

Werner's inclusion of motivation among the emerging set of mediating devices serves as an example of theoretical alleys in psychology that have been suggested and forgotten. Persons as constructors of their own motivation—via construction of cultural meanings—allow new forms of self-regulation to emerge in ontogeny and innovation of cultural meaning systems (as well as differentiation of language forms, e.g., metaphoric devices) in human history.

Werner was explicit about the *directiveness* of developmental processes (see Werner, 1957, p. 126 footnote), although most of his contemporary (and subsequent) developmental psychology has been wary of introducing teleological ideas into its core. Werner's thinking entailed a clear distinction between "primitive" (lower) and "civilized" (higher) forms of thinking (e.g., see Werner & Kaplan, 1956). This distinction was common in cognitive psychology of the 1920s and 1930s and was not a prey to ideologies for its value inclusiveness. Lev Vygotsky's thought explicitly accepted that notion, as did that of significant other contributors to our knowledge of development (e.g., Goldstein, 1971).

Microgenetic Investigations

Werner's own empirical credo was that of the experimental study of unfolding psychological phenomena in time. His *microgenetic* experimental focus was developed in parallel with Friedrich Sander's methodology of *Aktualgenese* (for an analysis, see Valsiner and van der Veer, 2000, chap. 7). If Werner, in the 1950s, had remained consistent with his method and the principle, all hypotheses generated at that intellectual junction would have needed to have been developmental (posit that one or another course of differentiation or de-differentiation be observable under specifically set experimental conditions). The hypotheses should have been about the actual *process of unfolding of structure* in development rather than about the *outcomes* of such development. Previously, Werner himself had argued against the elimination of the processes from consideration (Werner, 1937). However, by the 1950s, Werner's research program had changed: The range of empirical studies conducted under his supervision was rarely oriented to the processes under investigation, and he began using the outcomes-oriented statistical inferential techniques of the time (Lane, Magovcevic, & Solomon, 2005).

George Herbert Mead: Coordination of the Self and the Other

Analysis of Mead's work recently put it into the perspective of his own intellectual environment (Cook, 1993; Joas, 1985; Valsiner & van der Veer, 2000). For example, to overcome the separation of the person and society, as well as the intellectual fusion of these in pragmatist talk, Mead suggested a double-feedback loop model of differentiation of *both* the person (different "me's" as well as the "generalized other"; Dodds, Lawrence, & Valsiner, 1997) and the social world. The person acting within an environment changes it, and feedback and outcomes from this process lead to the intrapsychological reconstruction of the self. The reconstruction, in turn, further feeds actions on the environment resulting in a change, and so on. The process of differentiation of the subject and object maintains the dynamic relation between them, yet the process is constantly undergoing change:

> [R]esponse to the social conduct of the self may be in the rôle of another—we present his arguments in imagination and do it with his intonations and gestures and even perhaps with his facial expression. In this way we play the rôles of all our group; indeed, it is only so far as we do this that they become part of our social environment—to be aware of another self as a self implies that we have played his rôle or that of another with whose type we identify him for purposes of intercourse. The inner response to our reaction to others is therefore as varied as is our social environment. (Mead, 1913, p. 377)

The inner and outer worlds of acting persons thus become differentiated in coordination, and transformation in one leads to transformation in the other (see Figure 4.8).

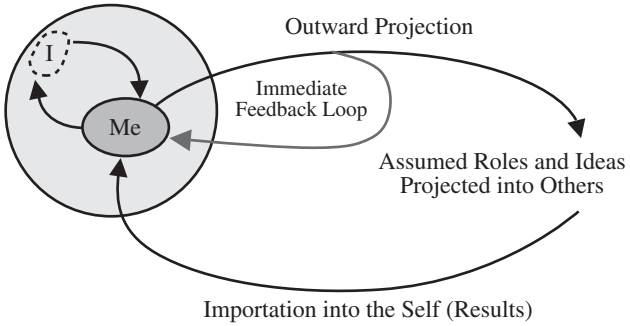


Figure 4.8 A schematic depiction of the core of development as understood by G. H. Mead.

The self is open-ended for novelty construction in three ways:

1. The *internal feed-forward cycle* (ME → I → ME). This is the internal loop that drives the accessible part of the self (ME) to changes in its state and to acting in new ways toward the environment.
2. The *immediate feedback cycle*. This operates "on line" when a person acts toward the environment, even before any response from the environment is obtained, the person analyzes what is being created as an output (e.g., I write these lines, before you tell me how stupid they are, I myself understand that they are).
3. The *pragmatic feedback cycle*—importing of the results of one's actions toward the environment into the self.

The integration locus of all three loops is the intrapsychological self-unit termed *ME* that links the internal and external dynamic flows of constant dynamic input. Some of it comes from results of actions, other, anticipation, or the "internal infinity" (the I) of the person.

Lev Vygotsky and Dialectical Synthesis

The core of Vygotsky's work was the demonstration of the presence of construction of novelty in the process of living-through experiences (Van der Veer & Valsiner, 1991, 1994, chap. 9; Vygotsky, 1971). Development from his viewpoint entailed differentiation of psychological functions (from "lower" to "higher" levels, distinguished by the semiotic mediation of volitional processes).

Vygotsky was aware of the need to rethink existing methods of psychology to allow for the study of the differentiation process. Hence, his "method of double stimulation" entails the analysis of the process by which the subject constructs further differentiation of the stimulus field, given the goal orientation of a task (Valsiner, 2000c). The main reason for constructing such methodology was the need to discover the moment at which a person arrives at a dialectical synthesis, both within the line of actions (similar to Karl Bühler's study of thinking processes, Valsiner, 1998b; followed by Köhler's insight-based problem solving by apes) and between the lines of action and semiotic reflection. In the latter case, the current problem-solving situation can be restructured in terms of its meaning, which guides the person's relations with that situation. Human capacity to move from acting to speaking to contemplating to generalization of the meaning to general states of the *psyche* (e.g., the states of "depression" or "happiness") constitutes a process of psychological differentiation in which higher mental functions become integrated into the structure of all functions in a control role.

The Method of Double Stimulation

The method of double stimulation (MeDoSt) entails a number of radical ideas in reconstructing developmental psychology's experimental method (see Figure 4.9). First, it is explicitly structuralist, as the subject is viewed as encountering the *whole field* of the experimental setting (and not merely the elements of it that are purposefully varied—"independent variables"). Second, the subject is considered as the active agent who reconstructs that field by introducing into it the goal subfields ("stimulus-objects," in Vygotsky's terminology) and means to reach those goals ("stimulus-means"). This functional differentiation of the structured stimulus field into "goals" and "means"—leaving the rest of the field to constitute the background—is *guided* by the experimenter, but cannot be *determined* by him or her. The experimenter gives the subject a task embedded within the field, but the subject can refuse to perform that task and turn it into another one. The *psychological experiment is only partially controllable* by the experimenter.

Double stimulation entails two distinctions: "stimulus-object" (the task and its goals) and "stimulus-means" (means to the end of reaching the goal). This is the basic agent/subject-object differentiation that is necessary for any problem-solving setting to emerge (Simon, 1999). This component is shared between *Homo sapiens* and other primates or even species further away from humans on the evolutionary ladder (see Sarris, 1931, on dog's

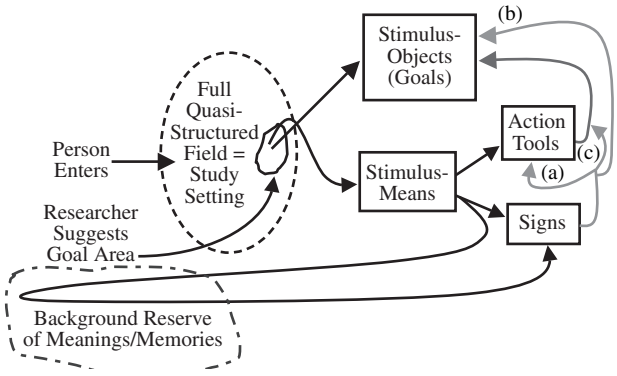


Figure 4.9 Components of Vygotsky's method of double stimulation.

mental capacities). Vygotsky borrowed the focus on means/ends distinction from Köhler's observations of chimpanzees.

There is a secondary differentiation of "double stimuli" between the two means that can be used to organize the subject's conduct in the experimental field. The *action tools* are created in the situation and constitute a synthesis of new functional uses of previously available objects—without, or with, modifications. There exist different qualitative levels of such synthesis; some do not require the presence of the human mind. Thus, the Japanese monkeys that invented the technique of potato washing (Hirata et al., 2001) merely regrouped their available environmental and bodily resources to invent a completely novel way of solving the problem of access to food. Likewise, Köhler's chimpanzees at Tenerife, as well as many generations of primate problem solvers in laboratories and zoos, or in the wild, creatively combined existing resources in new ways (Matsuzawa et al., 2001). A crucial qualitative breakthrough occurs in phylogeny when existing forms of the action resources are modified by the actor to fit the task and the modification know-how retained in the collective memory of the species. For chimpanzees, the making of action tools shows the difference here.

The MeDoSt requires the investigation of the uses of varied *signs*—semiotic means by the actor. Like action tools, signs can be constructed in the here-and-now setting for specific task demands, or imported to the present setting from a previous setting. It is through these semiotic mediating devices that a link between past and present situations becomes extrapolated to an anticipated future. Human subjects, through the use of language—thinking and speaking—constantly make their own meaning.

The construction and use of semiotic means includes the context of a psychological experiment. The subject (participant-to-be-studied) makes sense of the flow of events that is happening to him or her after agreeing to take part in a study.[6] The signs a human being uses three parallel functions:

1. They allow the person to give meaning to the act of instrument construction or selection (*a* in Figure 4.9).
2. They provide meaning for the act of striving toward reaching the goal (*b*).
3. They maintain the persistence of the effort of using the tools to reach the goal (*c*).

Human intrinsic motivation is semiotically constructed; the meaning of "trying, and trying again" (persistent imitation, Baldwin, 1906) is based on the personal culture (Valsiner, 2000c) and fortified through affectively hyper-generalized semiotic means.

This interpretational activity of the subject is not controllable by the experimenter, and the subjects' emerging meanings of the research situation cannot be eliminated. Human psychological research is necessarily personological and historical in its nature. Generations of psychologists since Ebbinghaus have tried their utmost to eliminate that inter-individual variability of past knowledge carrying over into the study context. They failed. Vygotsky's methodological ingenuity was in his decision to turn that inevitably uncontrollable moment of human interpretation around and make a virtue of something that would usually be considered vice (Toomela, 2003). The meaning-making process in a study was investigated. The equivalent of the "dependent variable" in his method was the microgenetic process by which the subject attempted to reach the goal and the corresponding construction of meanings. The empirical basis of Vygotsky's ideas was that of Gestalt psychological experimentation with primates and of Mikhail Basov's investigations of children's behavior.

The Zone of Proximal Development

The *zone of proximal development* (ZPD) is usually defined as the difference between what a child can accomplish with guidance, relative to individual performance (i.e., the sociocentric definition), or the process in which the child transcends the present level of development in constructive play (Vygotsky, 1966). In both cases, the concept is a hostage to the realities of irreversible time.

Irreversibility of time sets up very specific demands for the developing person. First, the person is always the agent in any ongoing interaction with the environment. Other agents are only episodically involved; that is, no

[6] The labels used to denote people who participate in psychological research are an interesting case of meaning-making on their own. Having originally been called *observers* (in the introspectionist paradigm—people who observed their inner psychological processes) they became *subjects* (e.g., the widely used slang "running the subjects"—a remnant of the time when the white rat took the place of the introspecting person), and in our time they became *research participants,* which denigrates the role of the researchers because they also are participants in the encounter with persons they want to study.

"social other" can live the life of the particular developing child. The experience of the developing child is unique (as was emphasized by Bergson), and although that flow is constituted through social interaction, its psychological nature remains personal and inevitably subjective. The nature of this experience can be called the "time-dependent egocentrism" of development. The idea of the central role of intra-psychological affective and mental processes does not diminish the role of the social others in the course of human development, but merely keeps the focus on the developing child who is the only person knowledgeable about his or her life experiences (Valsiner, 1989).

Second, the personal experiencing process of microgenesis of action within environment determines the *possible* conditions for the construction of the immediate next moment in a personal experience. Out of those possibilities, the actual experiencing dictates the actual next present moment (formerly the nearest future). The crucial role here remains in the synthesizing functions of the person's psychological system, which accomplishes that with, or without, immediate social support (in the form of scaffolding or teaching). Thus, the role of the social other in the learning process is both important and unimportant. It is important because the social others set up the environments that are experienced by the developing person. At the same time, the presence of the social others in each and every encounter of the child with the environment is not necessary (or is it possible); the developing child experiences both individually and socially guided encounters with the world as a singular person. The origin of the ZPD can be found in Henri Bergson's thinking:

> [C]onsciousness is the light that plays around the zone of possible actions or potential activity [French: *activité virtuelle*] which surrounds the action really performed [French: *qui entoure l'action effectivement accomplie*] by the living being. It signifies hesitation or choice. Where many equally possible actions are indicated without there being any real action (as in a deliberation that has not come to an end), consciousness is intense. Where the action performed is the only action possible (as in activity of the somnambulistic or more generally automatic kind), consciousness is reduced to nothing. Representation and knowledge exist none the less in the case if we find a whole series of systematized movements the last of which is already prefigured in the first, and if, besides, consciousness can flash out of them at the shock of an obstacle. From this point of view, *the consciousness of a living being may be defined as an arithmetical difference between potential* [virtuelle] *and real activity. It measures the interval between representation and action.* (Bergson, 1907/1911, pp. 159–160; French original inserts from Bergson, 1907/1945, pp. 154–155)

If we leave aside Bergson's occasional return to mechanistic concepts (i.e., of "arithmetical difference"), the rest of his conceptualization of the constructive nature of consciousness seems very modern. The developing person constantly faces complex choice points in one's life course where new actions (and their semiotic representations) need to be constructed. These constructions are the nearest "neighbors" to the already existing actions. The person constantly moves beyond a previously established state to areas of acting and thinking that had not yet been actualized. This is the essence of the "zone of proximal development" idea later used as a metaphor by Vygotsky.

The Zone of Proximal Development as the Meeting Zone of Present and Future

The ZPD is necessarily a concept where the teacher and learner roles are interdependent and asymmetric: The teacher attempts to "keep" the learner within his or her "zone of operation" generated by the teaching goals, while the learner may attempt to renegotiate the limits of his or her zones. The negotiation of teaching/learning tasks may involve intricate distancing-undistancing movement by both sides (Maciel, Branco, & Valsiner, 2004).

What is (and is not) projected into the ZPD depends on the success (or luck) of the microgenetic intervention and on the process of encounter between the social other and the developing person (our target organism). A teaching experiment is merely a context in which one of the two teleological orientations (i.e., the goal orientation of the teacher) is relatively fixed in its direction, while the other (of the learner) is not (and cannot be) assumed to have similar directionality (Branco & Valsiner, 1992). Rather, the learner has the possibility to diverge from or converge with the goal orientations of the teacher. The learner can likewise assume a neutral or noncooperative stance, undermining the teaching efforts (Poddiakov, 2001, 2005). As a result, it is not possible to "measure" the ZPD on the basis of the mere success or failure of a teaching experiment (i.e., on the basis of outcomes of the teaching efforts). Instead, a direct look at the process of joint construction of a teaching/learning event can give the investigator an insight into the learner's move beyond the present state of development.

Mikhail Basov's Theory of Dynamic Structural Forms

Basov's work, now available to a modern readership (Basov, 1991), originates from Gestalt psychology and its unification with developmental principles (Valsiner, 1988, chap. 5). In contrast to Vygotsky, who remained largely unspecific when the processes of dialectical synthesis were questioned, Basov demonstrated the emergence of novel differentiated structures through the use of three increasingly complex forms (and the "transitional forms" between them) constructed in ontogeny (Basov, 1929, 1931, 1991; see also Valsiner, 1988, chap. 5).

First, the *temporal chain of acts* is a form where actions follow one another without specific connections in time. These are actions triggered by the given situation at the given time. Neither past experience nor expectations for the future are involved in this flow of context-specific behaving. An example of this form may be taken from the erratic sequence of activities of a toddler, who may move from one area to another, involved in a sequence of activities without linkage to one another.

Second, the *associatively determined process* is a structural form of behavior that operates on the basis of associations between the present state and past experiences. This differentiated structure entails continuity in time from past to present (e.g., our contemporary modeling efforts of temporal processes through Markovian analyses, and other forms of time-series analyses, are axiomatically limited to detect this form of differentiation by Basov). However, the differentiation of form here does not include any orientation toward the future; hence, it cannot be viewed as the ultimate result of differentiation.

Third, the *apperceptively determined process* constitutes the unification of the linkages past → present and present → expected future. The expectations for the future—the apperceptive focus—provide the structure of action in any given moment of its focus. This is used to integrate selected associative ties with past experiences into the structure, which then is instrumental in bringing about *a* future.

Basov's perspective in paedology bears certain resemblance to the action perspectives of our day (see Brandtstädter, Chapter 10, this *Handbook,* this volume). He clearly anticipated the need to consider the goals-oriented nature of human action as the maker of the *foci* in the otherwise loosely differentiated field of human *psyche.*

Kurt Lewin's Topological Psychology

Lewin's dynamic view on human action and thinking was a significant contributor to psychological ideas (Zeigarnik, 1981). It was a general methodological orientation that radically transcended the associationist worldview of most of psychology. Thus, he stated:

> Field theory is probably best characterized as a method: namely, a method of analyzing causal relations and of building scientific constructs. This method of analyzing causal relations can be expressed in the form of certain general statements about the conditions of change. (Lewin, 1943, p. 294)

The unity of the fields leads to explanations of change in terms of field structure and forces (Lewin, 1935, 1938, 1939) or gradients (Gurwitsch, 1922; Waddington, 1966, 1970). The effort Lewin undertook was to overcome the "Aristotelian models" in psychology (Lewin, 1931; Valsiner, 1984). Instead of letting an average or most frequently observed case represent the reality of psychological functions (i.e., what Lewin designated as "Aristotelian model" of thought), he attempted to analyze the whole field structure of the active person. The emphasis on the field structure and its transformability was a productive way to accomplish this goal.

Processes in the Field of Life Space

Even as its main focus was to describe the fields of the present state of the psychological functioning of the person (Lewin, 1935, 1936a, 1936b, 1938), the developmental side of his field theory existed in efforts to explain the person's navigation within a field and in microgenesis of the person's "life-space" change. That navigation entails reconstruction of personal meanings (Lewin, 1942). The person's psychological field structure during an entrance into a novel environment is undifferentiated and becomes differentiated through the sequence of the person's actions while exploring the environment (Lewin, 1933, 1943). Empirical work that was guided by Lewin provided classic illustrations of such situation transformation process (e.g., the Zeigarnik effect; Zeigarnik, 1927). Zeigarnik and Lewin demonstrated the formative role of unfinished activity on the memory processes.

Lewin's general ideas on methodology matched these empirical practices. His focus on the experimental method in developmental psychology as targeting the

conditions under which one or another *transformation of the field could be demonstrated* (i.e., conditional-genetic analysis; Lewin, 1927) opened the door to others for direct investigation of differentiation processes (e.g., Boesch, 1991; Bourdieu, 1973, 1985; Bronfenbrenner, 1979; Bronfenbrenner & Morris, Chapter 14, this *Handbook,* this volume; Valsiner, 1987). The starting point for all systematically developmental analyses is some version of a field theory (Valsiner & Diriwächter, 2005) or the use of dynamic-structural metaphors ("the web"; see Fischer & Bidell, Chapter 7, this *Handbook,* this volume). Any perspective on development that claims to be based on the dynamic relationship of the organism with the environment has built its methodology in terms of fields rather than on points.

DYNAMIC APPROACHES IN DEVELOPMENTAL PSYCHOLOGY

In different areas of present developmental psychology, one can observe continuities with, and elaboration of, different kinds of differentiation models. Thus, Ford and Lerner (1992) demonstrate how the structure of "life course" emerges through differentiation (Ford & Lerner, 1992, pp. 200–204). Their version of the differentiation model entails a focus on *heterarchy* (in opposition to hierarchy), a differentiating structure in which "influences" move both from a "top-down" and a "bottom-up" direction (Ford & Lerner, 1992, p. 114).

Fogel (1993, 1999), being interested in the process of adult-infant communication, uses a differentiation model to investigate the emergence of relationships from the flow of interactive coregulation. The emergence of gestures from the flow of adult-infant interaction has been analyzed in depth by Lyra (Lyra, Pantoja, & Cabral, 1991; Lyra & Rossetti-Ferreira, 1995; Lyra & Winegar, 1997). In addition to articulation and hierarchical integration, development entails the process of *abbreviation* of the differentiating phenomena relative to their preceding states (Lyra, 1999).

The presence of abbreviation—loss of some aspects of the previously differentiated phenomenon—has been noted as important by researchers over many decades (e.g., Dewey, 1895, pp. 26–29). This loss has also been described as "fossilization of behavior" in the words of Lev Vygotsky. The function of such abbreviation in human semiotic construction is to preserve the phenomena of the past as feed-forward markers in the present—"one of the main functions of symbols is to 'abbreviate' reality" (Lyra & Rossetti-Ferreira, 1995). Differentiation of the speech and action lines in ontogeny, and the establishment of relative autonomy between them, allows semiotic mediating devices to take over regulation of development in dynamic, flexible ways. In the domain of social actions, children's construction of social roles in play (Oliveira, 1997; Oliveira & Rossetti-Ferreira, 1996) as well as adolescents' construction of personal secret meanings (Oliveira & Valsiner, 1997), are also examples. All these examples demonstrate how general principles of differentiation guide a developing person toward autonomy of the intrapsychological and interpersonal domains. Georg Simmel's (1906, 1908) ideas of the emergence of secrecy as a cultural phenomenon fits the differentiation notion. In the opposite end of the personal/social separation, the processes of coregulation of interaction give rise to differentiated systems of metacommunication (Branco & Valsiner, 2005; Fogel & Branco, 1997).

Dynamic Systems Theory

Contemporary work using differentiation models received positive impetus from dynamic systems theory (DST), and particularly from the potentials that experimental theoretical psychology (van Geert, 1998, 2003) provides for its formal modeling efforts. In the recent 2 decades, the use of DST has increased in developmental psychology (Lewis, 1995, 2000; 2005; Smith & Thelen, 1993; van Geert, 2003). It has an appeal for psychologists that most other recent formal analysis methods lack.

DST is sensitive to nonlinearity of processes, it builds its models on phenomena of variability, and it allows the researchers to see unity within the diversity (Aslin, 1993). DST introduces a future state of the system—that of attractor state—into its theoretical core. In a discipline where future is largely ignored—as it entails behavior that is not yet present—such theoretical insight is certainly revolutionary. DST has reintroduced to psychology the focus it needs: dynamic processes. These dynamic processes include emergence of novel structures from the relations between previously existing ones, under some circumstances of the system-environment relations (such as far from equilibrium states; Nicolis, 1993). This makes DST into a fitting suitor for the developmental sciences that have suffered from the absence of models that take emergence of novelty into account (Fogel, 1999; Lewis, 2000, 2005; van Geert, 2003).

The two central concepts of the dynamic focus include the *trajectory* (movement through time) and the

attractor. Trajectories represent the outcomes of dynamic processes. These outcomes can be described by their direction: extrapolating from the previously observed part of the trajectory to its continuation or from an expected continuation to the present, which is the basis for the introduction of attractors. For a dynamic system, the "attractor" is the end point of the trajectory. Dynamic processes tend toward a relatively stable state of the system; thus, the idea of an attractor entails *tending toward.* An *attractor* is the region of the state space toward which all nearby trajectories tend (Clark, Truly, & Phillips, 1993, p. 74). Specifying such points or areas of convergence in the future provides the present movement toward this future specifiable state.

Progressing Equilibration

The ideas of differentiation and integration have reemerged consistently in the history of developmental psychology. Nevertheless, these ideas have been used to capture the external picture of development as it unfolds over time. The internal (process) mechanisms of such differentiation are rarely made explicit (Janet's "tension" idea, alongside various efforts to consider "synthesis" in the differentiation process are steps in that direction). This has led some leading developmental scientists to admit a state of stagnation in our science, particularly when the issues of application are of importance:

> [M]ost of the research falls well short of identifying the crucial mediators of the causal processes or the effective elements of prevention or treatment. We know a lot about risk and protective indicators, but much less about risk and protective causal processes. (Rutter, 2003, p. 376)

It is in the equilibration models where the issue of organization of the making of new differentiated states comes to the focus of attention. Equilibration models expand our thinking about differentiation. Some such models focus on the actual synthesis of the novel form at a higher level of hierarchical integration. These models include systems that entail:

- An initial state of harmonious existence of a system
- Emergence of some disruption in that state, due to perturbations in the organism-environment relations
- Time-dependent (as well as teleological) movement toward the restoration of the initial state of harmony (equilibration) or synthesis at a higher level of hierarchical organization (progressing equilibration, synthesis)

It is the teleological movement that is the major constitutive criterion of the equilibration models because in some version neither does the outcome need to be accepted as restoring the "harmony" nor is the original "harmony" harmonious. Thus, dialectical perspectives that posit transition from one form of "contradiction" to another (new) one (Riegel, 1975, 1976), as well as all disequilibration models, fit under the general label of Dyamic Systems theory. Likewise, equilibration/disequilibration is central for the focus on organization and disorganization within developmental systems theory (Ford & Lerner, 1992, pp. 171–173).

The prehistory of the equilibration models in recent Western theoretical thought goes back to the thinking of Herbert Spencer who viewed the existence of living organisms in terms of a system of movements toward an *average* equilibrium state (1864; paragraphs 170–176). As such, this emphasis was merely a transition of the dominant role attributed to the average in the time-based change processes (Valsiner, 1984, 1986). Mere extension of the average-affirming processes to cover those of development was a way to fit the latter into an organized frame of preservation of the predictability of change processes.

Development through Disequilibriae: Peirce, Bergson, and Piaget

Charles Sanders Peirce formulated what, in our time, could be recognized as a law of development through disequilibration:

> [P]rotoplasm is in an excessively unstable condition; and *it is the characteristic of unstable equilibrium, that near that point excessively minute causes may produce startlingly large effects.* Here, then, the usual departures from regularity will be followed by others that are very great; and the large fortuitous departures from law so produced, will tend still further to break up the laws, supposing that these are of the nature of habits. Now, this breaking up of habit and renewed fortuitous spontaneity will, according to the law of mind, be accompanied by an intensification of feeling. The nerve-protoplasm is, without doubt, in the most unstable condition of any kind of matter; and consequently, there the resulting feeling is the most manifest. (Peirce, 1892, p. 18, emphasis added)

Peirce here undoubtedly antedated the popular fascination with "chaos theory" of our time. He emphasized that it is through the constant process of disequilibration—taking place in irreversible time—that conditions are created for the living organisms to construct new preadaptational forms. The irreversibility of time arrives, slowly and painfully, into the theoretical models of developmental scientists of the twentieth century through the philosophy of Henri Bergson.

Bergson's (1889, 1896/1988, 1907/1911) philosophy is widely known, but not well known in its substance. He borrowed greatly from the traditions of "organic evolution" thought of the 1890s, which were the focus of discourse thanks to the efforts of Henry Osborn, James Mark Baldwin, and C. Lloyd Morgan. Bergson's emphasis on the contrast between living and nonliving objects related closely with the natural-scientific debates of the 1890s. The idea of duration is the basis for his claim of a drastic difference between the living systems and the isolated ones (i.e., physical objects), as living systems are always in the *process of becoming.* Bergson's criticism of the science of his time was directed at the unwarranted transfer of analytic ideas from the study of the inanimate world to that of natural systems. In natural systems, the past (through selective memory) enters into the construction of novelty in the present. The process of becoming is that of creative adaptation that goes beyond the immediate needs of the environment.

Constructive Orientation to the Dynamic World: Anticipatory Preadaptation

Bergson's developmental thought was based on the concept of *adaptation.* That concept, popular as it was (and is), can carry different meanings. First, it has been seen as a direct reaction to the conditions that are causing change—either "positive" (by way of giving rise to new variations) or "negative" (elimination of emerged variations that do not fit the environmental demands). Bergson (1907/1911) disagreed with both of these meanings (on the basis of their mechanistic elaboration, p. 63) and called for seeing adaptation in the process of the emergence of novel mechanisms in ways *coordinated with* context demands (but not "molded" or "shaped" by them). Thus, in psychological development, the psychological functions develop new organizational forms that make it possible for them to encounter new conditions in the future (as opposed to the idea of "fitting in" with the environmental demands of the present). The adaptations are organic (systemic) growths, oriented toward a set of future possibilities (which, as those do not exist in present, cannot be precisely defined). Nevertheless, these new forms canalize the further encounters of the organism and the environment (e.g., Bergson's discussion of canalizing involved in vision, pp. 105–108; and in the role of concepts in canalizing conscious processes, pp. 305–308). In creative adaptation, the organizational forms that emerge in adaptation go beyond a "fit-with" the present state of the survival conditions and set the basis for facing the challenges of the possible future demands. Bergson's kind of adaptation is a prime example of the relevance of the "goodness of misfit" in the process of development (Valsiner & Cairns, 1992).

Jean Piaget's constructivist perspective on personal and social knowledge creation emerged at the intersection of his psychodynamic orientation and psychometric work tasks (Amann-Gainotti, 1992; Amann-Gainotti & Ducret, 1992; Chapman, 1988; see also an autobiographic retrospect in Piaget, 1952). In his work, Piaget looked at genetic epistemology from his dynamic structuralist perspective, being ambiguous about the stance of this perspective in terms of evolutionary thought (Hooker, 1994). Piaget's structuralism was a continuation of the Gestalt psychological thought, yet it posed as a third alternative to both elementaristic empiricism and holistic philosophizing (Piaget, 1970a, 1971a, chap. 1). Thus, by *genetic epistemology,* Piaget had in mind "study of the way in which the subject constructs and organizes his knowledge during his historical development (ontogenetic and sociogenetic)" (Piaget, 1965, p. 31). The study of the construction of the structure of knowledge allows for the understanding of that very structure that is being constructed.

A structure contains "certain unifying elements and connections, but these elements cannot be singled out or defined independently of the connections involved" (Piaget, 1971b, p. 139). As the structures are dynamic, they are involved in functioning in the context of their wider structural ties:

> [F]unction is the action exerted by the functioning of a substructure on that of the total structure, whether the latter be itself a substructure containing the former or the structure of the entire organism. (p. 141)

Piaget's dynamic structuralism was aimed at capturing both the developmental process and the continuous maintenance of existing organizational forms. The latter aspect has led investigators to trace the philosophical influences of Immanuel Kant in his thought (e.g.,

Fabricius, 1983), while the former can be linked with his continuing concern with creativity in evolution very much along Bergsonian lines (Chapman, 1988, 1992; Piaget, 1952).

Piaget's building of his theoretical system on the open-systemic nature of knowledge construction led him to address the issues of possibilities, impossibilities, and necessities (Piaget, 1986; Piaget & Voyat, 1979; Vuyk, 1981). The process of knowledge construction is dynamic; each possibility for structural transformation is an outcome of a previous transformation and makes it possible to move on to the next structural state. The basis for such a dynamic restructuring process is the general property of autoregulation.

Progressing Equilibrium

The main developmental mechanism that emerged in Piaget's mostly empirical research (and quite slowly—over 4 decades—by 1957) is that of equilibration (Moessinger, 1978; Rowell, 1983). Piaget's equilibration concept encompasses *progressing equilibration* (*equilibration majorante*), a process that would not reach an equilibrium state. Hence, Piaget's notion of development is open-ended in its allowance of construction of new structures:

> We can observe a process (hence the term "equilibration") leading from certain states of equilibrium to others, qualitatively different, and passing through multiple "nonbalances" and reequilibrations. Thus the problems to be solved involve various forms of equilibrium, the reasons for nonbalance, and above all the causal mechanisms, or methods, of equilibrations and reequilibrations. It is especially important to stress from the very beginning the fact that, *in certain cases, the reequilibrations merely form returns to previous equilibriums;* however, those that are fundamental for development consist, on the contrary, in the formation of not only of new equilibriums but also in general of better equilibriums. We can, therefore, speak of "increasing equilibrations," and raise the question of self-organization. (Piaget, 1977, pp. 3–4, emphasis added)

Piaget had his own uncertain equilibrium between the mind-sets of classical logic and of the Bergsonian focus on irreversible duration. In classical logic, the thought processes were free of the irreversibility of time, and hence one could introduce concepts such as reversible operations, regression to previous equilibriae, and so forth. In contrast, within the Bergsonian mind-set, phenomena that look like "regressions" are actually de-differentiations of more complex previous structures in ways that are similar to, but not identical with, some previous states. It can be argued (Valsiner, 1987, pp. 52–58) that Piaget's theoretical construction was imbued by that tension all through his career, leading to inconsistencies in his various expressions of equilibration.

Piaget relied heavily on equilibration as a process that contains two "part" processes: assimilation and accommodation. *Assimilation* entails the "integration of external elements into evolving or completed structures" (Piaget, 1970b, p. 706), while *accommodation* is defined by Piaget as "any modification of an assimilatory scheme or structure by the elements it assimilates" (p. 708). Piaget created these part-processes of the progressing equilibration as mutually interdependent parts of the same functional whole:

> [A]ssimilation and accommodation are not two separate functions but the two functional poles, set in opposition to each other, of any adaptation. So it is only by abstraction that one can speak of assimilation alone . . . but it must always be remembered that there can be no assimilation of anything into the organism or its functioning without a corresponding accommodation. (Piaget, 1971b, p. 173).

Ironically, many psychologists' renderings of Piaget's equilibration idea have failed to recognize this mutuality of the two processes. Piaget himself perhaps fed into the tendency to separate assimilation and accommodation from each other, as he reverted back to writing about their relationships in terms of a "balance" or "ratio" (e.g., Piaget, 1970b, p. 708).

Development through "As-If" Structures Unfolding in Time

The irreversibility of time sets up duality of human psychological functions: Our actions and reflections on those actions are between ourselves and our environment (*res media*—Fischer & Bidell, Chapter 7, this *Handbook,* this volume) but also between the present and the impending future in all of its uncertainty. Hence, persons can only act *as-if* they were different from what they are (in the present) as they anticipate what they might be (in the future). They act as if they were another person, but in reality they remain themselves. Still, by acting in the "as-if" mode they create the conditions for their own development.

At the turn of the century, the focus on human *as-if* (als-ob) type actions was systematically analyzed by Hans Vaihinger (Vaihinger, 1920). Vaihinger's philosophy brought into science the inherent duality in the existence. The person simultaneously IS and IS-NOT-YET—in every act of being is a process of potential becoming (Valsiner & van der Veer, 1993). The person is constantly on one's way that entails some form of ambivalence between *Heimweh* and *Fernweh* (Boesch, 1997, pp. 79–128)—our movement is oriented toward exploring the unknown while holding on to the known. Development necessarily entails construction of an "as-if" (or, desired state) image (Smythe, 2005), which is then striven for by the developing person. The basic duality that guides human development is that of constructing a constant contrast between the present state ("as-is") and the desired state ("as-if"). This contrast requires the relevance of constant empathic process between the two states (Josephs, 1998). The developing person has to "feel into" the existing "as-if" state and act to overcome this difference.

"Feeling Into" Others (Einfühlung): Intersubjectivity

Similar issues were raised by Theodor Lipps's "aesthetic theory" of *Einfühlung* or "feeling into" (Lipps, 1903, 1923; Witasek, 1901). When asking how an observer of an object of art can experience feelings similar to that of the author or another observer, it raises a relevant general question about human understanding (Wispé, 1987). On the basis of early childhood empathy, sophisticated versions of aesthetic experiencing can develop in ontogeny that are viewed as complex forms of coordination between the differentiated "as-is"→"as-if" structures as those unfold in time. Vygotsky's focus on "dialectical synthesis" (Vygotsky, 1925/1971) as well as Baldwin's focus on "aesthetic semblance" (Baldwin, 1911, 1915) were examples of theoretical constructions that elaborated that major issue.

In our times, the question of "as-if" type existence is largely subsumed under the label of intersubjectivity. The basis for any construction of *intersubjectivity* is a set of fundamental axioms for the social world:

> [F]irst, the existence of intelligent (endowed with consciousness) fellow-men and, second, the experienceability (in principle similar to mine) by my fellow-men of the objects in the life-world . . . I know that "the same" Object must necessarily show different aspects to each of us. First, because the world in my reach cannot be identical with the world in your reach, and so on; because my here is your there; and because my zone of operation is not the same as yours. And, second, because my biographical situation with its relevance systems, hierarchies of plans, and so on, is not yours and, consequently, the explications of the horizon of objects in my case and yours could take entirely different directions. (Schütz & Luckmann, 1973, p. 59)

Two socially constructed idealizations are involved here: *interchangeability of standpoints* and *congruence of relevance systems* (Schütz & Luckmann, 1973, p. 60). Any teaching/learning situation is at odds with this concept of intersubjectivity: The teacher's standpoint (role) is not interchangeable with that of the student, and the congruence of relevance systems of the teacher with those of the learner need not be taken for granted. Furthermore, we know that intersubjectivity itself has a multilevel structure of organization (Coelho & Figueiredo, 2003; Gillespie, 2003; Kirschner, 2003) and it has a reality component in interobjectivity (Moghaddam, 2003).

Post-Piagetian and Post-Vygotskian Models

It is notable that amid the variety of development models formulated after Piaget, the focus has remained on the description of levels (or stages) rather than on the mechanisms through which the developing child advances from one state or stage to another. Fischer's "skill theory" (Fischer, 1980; Fischer & Bidell, 1998, and Chapter 7, this *Handbook,* this volume; Fischer & Ferrar, 1987, 1992; Fischer et al., 2003) makes an effort to conceptualize the transition through a focus on unevenness of development at any time. On the basis of such unevenness, the progressing equilibration (or dialectical synthesis of novelty) can be easily put into theoretical use in the model. This was attempted by Pascual-Leone (1976), yet without persistence or empirical precision. However, the careful analysis of Robbie Case in the domain of children's cognitive progression provides precision to the transition between stages (Case, 1985, 1991). The issue of plasticity remains a crucial unsolved problem for post-Piagetian models of development because the mechanism of transition from state to state may include both orderly and disorderly forms, difficult to conceptualize in mechanistic terms (see Lerner, 1990; Toomela, 2003). Equilibration models necessarily have to deal with qualitative, directed, and progressive change (see Moshman, 1998) for which there exists relatively few formalized models.

Efforts to use contemporary fascination with "neural network" modeling (Fischer, Bullock, Rotenberg, & Raya, 1993) have led the question of explanatory mechanisms of cognitive development back to the time when it was still connected with neurological sciences (e.g., that of Bekhterev, 1994). Bekhterev's ever-grandiose system of a hierarchy of associative reflexes was the *de facto* model of the contemporary "neural networks" as those proliferate in computer-based models.

CULTURE IN HUMAN DEVELOPMENT

The focus on the "as-if" leads to reliance on semiotic mediation by human beings. By the end of the twentieth century, it became understood in psychology that it is not possible to ignore the major nature of human psychological phenomena—their socially constructed meaningfulness. Psychology is the science of meaningful conduct, and developmental psychology is the science of the emergence and transformations within the forms of such conduct (Valsiner, 2001c).

The emergence of various versions of cultural psychologies in conjunction with issues of developmental psychology (Boesch, 1989, 1991, 2003; Chaudhary, 2004; Cole, 1990, 1995; Eckensberger, 1997, 2003; Obeyesekere, 1990; Shweder, 1991, 1995; Shweder & Sullivan, 1990, 1993; Toomela, 2003; see also for reviews Jahoda, 1993, 1995; Krewer, 1992; Simão, 2005) provides an indication for the tendency in the discipline to break through the traditions of meanings avoidance that have been the core of the crisis in the discipline (K. Bühler, 1927/1978; Vygotsky, 1927/1982). It can be argued that human psychological phenomena exist within the *semiosphere,* a sphere of semiotic signs (Lotman, 1992), being constituted and reconstituted by active persons who are involved in processes of acting and reflecting on actions in parallel.

Focus on Participation

The desire to see persons as becoming involved in social events has fascinated researchers in the social sciences over the decades (Valsiner & van der Veer, 2000). Barbara Rogoff has attempted to make sense of the teaching/learning processes through a focus on participatory observational learning in cultural contexts for activities (Rogoff, 1990, 1992, 1993, 2003; Rogoff & Lave, 1984). Also, Michael Cole has taken further the notion of "zone of proximal development" and situated it in the middle of activity contexts. Cole's emphasis on the unity of teaching and learning processes emerges from his studies of cultural tools (Cole, 1995; Newman, Griffin, & Cole, 1989; Scribner & Cole, 1981). His theoretical construction is based on the "cultural practice theory" (Laboratory of Comparative Human Cognition, 1983).

The problem of relationships between microgenetic and situationally emerging ontogenetic phenomena in human development occupies the central focus of the "cultural practice theory." Cole has been interested in the ways in which context *selection* (Laboratory of Comparative Human Cognition, 1983, pp. 332–333) and *creation* (Newman et al., 1989, p. 12) are socioculturally organized. Cole's consistent interest in the zone of proximal development is congruent with his claim that "a cultural practice theory takes cultural contexts, that is, socially assembled situations, not individual persons or abstract cultural dimensions as the unit of analysis" (Laboratory of Comparative Human Cognition, 1983, p. 334). The main mechanism by which culture and person are related is that of *mutual interweaving*. Cole (1992, p. 26) uses the metaphor of "intermingling of threads from two ropes"—those of biological "modules" and cultural "contexts."

James Wertsch's work derives from the Vygotskian semiotic mediation viewpoint (Wertsch, 1979, 1983, 1995), on the one hand, and the activity theoretic perspective (Leont'ev, 1981), on the other (Wertsch, 1981). In his thinking about the ZPD, Wertsch viewed the dynamic process of situation redefinition as the primary means by which persons involved in a joint activity context guide one another's development. The partners are constantly in some relation of intersubjectivity (sharing similar situation definition), which they transcend by the process of situation redefinition (Wertsch, 1984, pp. 7–13).

By the mid-1980s, Wertsch turned to the integration of his semiotically mediated activity approach with the wider sociolinguistic context (Wertsch, 1985) that has been characterized by the dynamic worldview of Mikhail Bakhtin's literary theory (Bakhtin, 1981). His theoretical stance acquires a new layer: While the activity-framing remains in the background of Wertsch's accounts, the new layer of the theory entails a focus on interpretable utterance. Wertsch takes over Bakhtin's emphasis on dialogicality and makes it work

for his system. The multiplicity of "voices"—appropriated by the person from the sociocultural environment—led to the study of the complexity of these messages (Wertsch, 1990, 1991, 1995). The result is a consistent return to the study of ambivalences embedded in communicative messages. Different voices can be seen in the utterances in ways that "interanimate" or dominate each other during speaking in situated-activity contexts. On the basis of these contexts, macrolevel psychological phenomena, like historical identity, emerge in the process of development (Penuel & Wertsch, 1995).

Dialogical Models of the Self

In the second half of the 1990s, the tradition of looking at complex phenomena of the self in the dialogicality of "voices" gained greater popularity (Hermans, 1995, 2001, 2002, 2003). That perspective has yet to become utilized in developmental science or in the German tradition of cultural psychology (Boesch, 1983, 1989, 1991, 2003) that has focused on the construction of personal meanings (*fantasms*) at the intersection of acting and experiencing collective-cultural myth-stories in society. The parallel processes of striving-for-the-far-off (*Fernweh*) and striving-for-the-feeling-of-home (*Heimweh*) provide many possibilities for developmental science. The systemic activity approach is further advanced by Eckensberger (1995, 1997, 2003).

A recent tradition of looking at the uses of symbolic resources in the coping process with ruptures in the life course is a novel development of great promise (Perret-Clermont, Pontecorvo, Resnick, Zittoun, & Burge, 2004; Simão, 2003; Valsiner, 2001b; Zittoun, 2005; Zittoun, Duveen, Gillespie, Ivinson, & Psaltis, 2003). The field is poised at a major breakthrough—a development of new methodology will allow us to look at meaningful phenomena in the process of their transformation into new states. Such a breakthrough cannot come through accumulation of empirical research into "the literature" and by determining majority trends in that ("democracy of the literature"; Valsiner, 2000a). Instead, consistent science of development can emerge from the inter-disciplinary enrichment between the theoretical cores of all sciences where development as a direction of investigation matters—anthropology, sociology, protein genetics, embryology, and so on. Child psychology can participate in this progress if it adopts abstract thought models that fit the nature of developmental phenomena in the realm of psychology.

CONCLUSIONS: FROM DEVELOPMENTAL MODELS TO NEW METHODOLOGY

This chapter has been about consistency of basic ideas: If development is what we claim to study, the ways of studying it cannot be discordant with that objective. If development is conceptualized as a "process," it must be investigated as such rather than relying on standard nondevelopmental outcome "measures" to govern the empirical part of the knowledge construction effort. If development is conceptualized as involving "person" and "environment" relations, these relations must be studied in their actual functioning rather than static "snapshots" of the relating partners (see Magnusson & Stattin, Chapter 8, this *Handbook,* this volume). If variability is the crucial aspect of all developmental phenomena it makes no sense to get rid of it in our empirical data construction through averaging or prototyping (Fischer & Bidell, Chapter 7, this *Handbook,* this volume; Valsiner, 1984, 1986). Instead, alternative ways of conceptualizing that variability are appropriate (e.g., reaction norms, ranges, constraints, return to topological models).

Our contemporary developmental science has reached a critical junction. We borrow carefully from all the predecessors of developmental ideas—such as Baldwin, Mead, Vygotsky, Piaget—and turn those into new forms of theory and method construction. Method construction is predictably hard, as the social consensus in psychology does not appreciate direct study of development. Furthermore, the development of new empirical procedures is built on the remaking of a number of links in the general "methodology cycle" (see Figure 4.1).

First, the basic idea of causality in making sense of developing systems needs adjustment, and the phenomenological basis of child psychology as part of developmental science needs to take a world-wide and history-wide look at the lives of children, parents, grandparents, and then at social-religious and educational institutions that offer generous-looking help to the former in their coping with poverty and affluence, war and peace, and the private and public sides of living. This amounts to a kind of figure/background reversal; it becomes axiomatically accepted that all developmental phenomena are of quasi-structured fields (or webs, as Fischer and Bidell elaborate in Chapter 7, this *Handbook,* this volume). In the conceptual domain of such phenomena, new formal models will fit, and old—analysis of variance and correlation techniques—will not be

usable because they violate the axiomatic bases of developmental science.

Second, the advancement of person-centered (as opposed to variable-centered) research orientations in developmental science fit with the irreversible life-course nature of phenomena (Magnusson, 1988; Magnusson & Cairns, 1996; Magnusson & Stattin, Chapter 8, this *Handbook,* this volume). These orientations bring back to the center of our attention models of differentiation, equilibration, and unity of person-environment structures in mutual teaching/learning processes. This holistic look is further developed through models of signification fields (Rossetti-Ferreira, Amorim, Soares da Silva, & Carvalho, 2004) that constitutes new methodology for capturing the dynamics of the social context as it guides the development of the person. Understanding of development itself develops through construction of theoretical models, careful analysis of their nature, their fit with the phenomena, and the retaining of models that maintain the relevant facets of the phenomena of development as abstract generalizations. It is time for the study of child psychology to transcend its nature as belonging to the genre of "area studies"—where the area is that of children—and become genuinely productive science of development.

It may be that the time in early twenty-first century is ripe for that. Developmental science is once again saturating child psychology with developmental ideas and research practices, but it has a long way to go. For example, James Mark Baldwin's call for a "genetic logic" in the beginning of the past century is still far from being developed into a full-fledged formal core of the study of development. Yet, science keeps advancing, in its bursts and *status quos,* leaving monoculturally relevant discourses about children far behind and moving toward constructing a general, yet context sensitive, science of development.

REFERENCES

Allen, P. (1981). The evolutionary paradigm of dissipative structures. In E. Jantsch (Ed.), *The evolutionary vision: Toward a unifying paradigm of physical, biological, and sociocultural evolution* (pp. 25–72). Boulder, CO: Westview Press.

Amann-Gainotti, M. (1992). Jean Piaget, student of Pierre Janet (Paris 1919–1921). *Perceptual and Motor Skills, 74,* 1011–1015.

Amann-Gainotti, M., & Ducret, J.-J. (1992). Jean Piaget élève de Pierre Janet: L'influence de la psychologie des conduites et les rapports avec la psychanalyse. *L'Information Psychiatrique, 6,* 598–606.

Ash, M. (1998). *Gestalt psychology in German culture 1890–1967.* Cambridge, England: Cambridge University Press.

Aslin, R. N. (1993). Commentary: The strange attractiveness of dynamic systems to development. In L. B. Smith & E. Thelen (Eds.), *A dynamic systems approach to development* (pp. 385–389). Cambridge, MA: MIT Press.

Bakhtin, M. (1981). *The dialogic imagination.* Austin: University of Texas Press.

Baldwin, J. M. (1894). Personality-suggestion. *Psychological Review, 1,* 274–279.

Baldwin, J. M. (1898). On selective thinking. *Psychological Review, 5*(1), 1–24.

Baldwin, J. M. (1906). *Thought and things: A study of the development and meaning of thought, or genetic logic: Vol. 1. Functional logic, or genetic theory of knowledge.* London: Swan Sonnenschein.

Baldwin, J. M. (1908). Knowledge and imagination. *Psychological Review, 15,* 181–196.

Baldwin, J. M. (1911). *Thought and things: A study of the development and meaning of thought, or genetic logic: Vol. 3. Interest and art being real logic.* London: Swan Sonnenschein.

Baldwin, J. M. (1915). *Genetic theory of reality.* New York: Putnam.

Baldwin, J. M. (1930). James Mark Baldwin. In C. Murchison (Ed.), *A history of psychology in autobiography* (Vol. 1, pp. 1–30). New York: Russell & Russell.

Baltes, P. B., Lindenberger, U., & Staudinger, U. (1998). Life-span theory in developmental psychology. In W. Damon (Editor-in-Chief) & R. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 1028–1143). New York: Wiley.

Baltes, P. B., & Nesselroade, J. R. (1973). The developmental analysis of individual differences on multiple measures. In J. R. Nesselroade & H. W. Reese (Eds.), *Life-span developmental psychology* (pp. 219–251). New York: Academic Press.

Basov, M. (1929). Structural analysis in psychology from the standpoint of behavior. *Journal of Genetic Psychology, 36,* 267–290.

Basov, M. (1931). *Obshchie osnovy pedologii.* Moscow-Leningrad: Gosudarstvennoe Izdatel'stvo.

Basov, M. (1991). The organization of processes of behavior. In J. Valsiner & R. van der Veer (Eds.), *Structuring of conduct in activity settings: The forgotten contributions of Mikhail Basov. Soviet Psychology, 29*(5, Pt. 1), 14–83.

Bekhterev, V. M. (1994). *Collective reflexology.* Commack, NY: Nova Science.

Benetka, G. (2002). *Denkstile der Psychologie.* Wien, Austria: Wiener Universitäts Verlag.

Benigni, L., & Valsiner, J. (1995). "Amoral familism" and child development: Edward Banfield and the understanding of child socialization in Southern Italy. In J. Valsiner (Ed.), *Child development within culturally structured environments: Vol. 3. Comparative-cultural and constructivist perspectives* (pp. 83–104). Norwood, NJ: Ablex.

Bergson, H. (1889). *Essai sur les données immédiates de la conscience* [Time and free will: An essay on the immediate data of consciousness]. Paris: Presses Universitaires de France.

Bergson, H. (1911). *Creative evolution.* New York: Henry Holt. (Original work published in 1907)

Bergson, H. (1945). *L'Evolution créatrice* [Creative evolution]. Genève: Éditions Albert Skira. (Original work published 1907)

Bergson, H. (1988). *Matter and memory* (N. M. Paul & W. S. Palmer, Trans.). New York: Urzone/Zed Books. (Original work published 1896)

Boesch, E. E. (1983). *Das Magische und das Schöne: Zur Symbolik von Objekten und Handlungen.* Stuttgart: Frommann.

Boesch, E. E. (1989). Cultural psychology in action-theoretical perspective. In Ç. Kagitçibasi (Ed.), *Growth and progress in cross-cultural psychology* (pp. 41–51). Lisse, Germany: Swets & Zeitlinger.

Boesch, E. E. (1991). *Symbolic action theory and cultural psychology.* New York: Springer.

Boesch, E. E. (1997). *Von der Sehnsucht.* Saarbrücken, Germany: Privater Vor-Abdrück.

Boesch, E. E. (2003). Why does Sally never call Bobby "I"? *Culture and Psychology, 9*(3), 287–297.

Bourdieu, P. (1973). Cultural reproduction and social reproduction. In R. Brown (Ed.), *Knowledge, education, and cultural change* (pp. 71–112). London: Tavistock Publications.

Bourdieu, P. (1985). The social space and the genesis of groups. *Social Science Information, 24*(2), 195–220.

Bornstein, M. H. (1995). Form and function: Implications for studies of culture and human development. *Culture and Psychology, 1*(1), 123–137.

Branco, A. U., & Valsiner, J. (1992, July). *Development of convergence and divergence in joint actions of preschool children within structured social contexts.* Poster presented at the 25th International Congress of Psychology, Brussels, Belgium.

Branco, A. U., & Valsiner, J. (1997). Changing methodologies: A co-constructivist study of goal orientations in social interactions. *Psychology and Developing Societies, 9*(1), 35–64.

Branco, A. U., & Valsiner, J. (Eds.). (2005). *Metacommunication and communication in human development.* Greenwich, CT: InfoAge Press.

Bronfenbrenner, U. (1979). *The ecology of human development.* Cambridge, MA: Harvard University Press.

Bronfenbrenner, U., & Crouter, A. C. (1983). The evolution of environmental models in developmental research. In W. Kessen & P. Mussen (Eds.), *Handbook of child psychology: Vol. 1. History, theory, and methods* (pp. 357–414). New York: Wiley.

Bronfenbrenner, U., & Morris, P. (1998). The ecology of human development processes. In W. Damon (Editor-in-Chief) & R. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 993–1028). New York: Wiley.

Brush, S. G. (1996). The reception of Mendeleev's Periodic Law in America and Britain. *Isis, 87,* 595–628.

Budwig, N., Valsiner, J., & Bamberg, M. (1998). Situating Rogoff: The inter-disciplinary study of human development. *Clark Working Papers on Developmental Psychology, 1*(1), 1–16.

Bühler, C. (1934). *Der menschliche Lebenslauf as psychologishes Problem.* Leipzig, Germany: S. Hirzel.

Bühler, K. (1978). *Die Krise der Psychologie.* Frankfurt-am-Main, Germany: Ullstein. (Original work published in 1927)

Cairns, R. B. (1986). Phenomena lost: Issues in the study of development. In J. Valsiner (Ed.), *The individual subject and scientific psychology* (pp. 97–111). New York: Plenum Press.

Cairns, R. B. (1998). The making of developmental psychology. In W. Damon (Editor-in-Chief) & R. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 25–105). New York: Wiley.

Carolina Consortium on Human Development. (1996). Developmental science: A collaborative statement. In R. B. Cairns, G. Elder, & E. J. Costello (Eds.), *Developmental science* (pp. 1–6). New York: Cambridge University Press.

Case, R. (1985). *Intellectual development: Birth to adulthood.* Orlando, FL: Academic Press.

Case, R. (1991). Stages in the development of the young child's first sense of self. *Developmental Review, 11,* 210–230.

Chapman, M. (1988). *Constructive evolution.* Cambridge, England: Cambridge University Press.

Chapman, M. (1992). Equilibration and the dialectics of organization. In H. Beilin & P. Pufall (Eds.), *Piaget's theory: Prospects and possibilities* (pp. 39–59). Hillsdale, NJ: Erlbaum.

Chaudhary, N. (2004). *Listening to culture.* New Delhi, India: Sage.

Chernoff, J. M. (2003). *Hustling is not stealing: Stories of an African bar girl.* Chicago: University of Chicago Press.

Clark, J. E., Truly, T. L., & Phillips, S. J. (1993). On the development of walking as a limit-cycle system. In L. B. Smith & E. Thelen (Eds.), *A dynamic systems approach to development* (pp. 71–93). Cambridge, MA: MIT Press.

Coelho, N. E., Jr., & Figueiredo, L. C. (2003). Patterns of intersubjectivity in the constitution of subjectivity: Dimensions of otherness. *Culture and Psychology, 9*(3), 193–208.

Cole, M. (1990). Cultural psychology: A once and future discipline. In J. Berman (Ed.), *Nebraska Symposium on Motivation* (Vol. 37, pp. 279–336). Lincoln: University of Nebraska Press.

Cole, M. (1992). Context, modularity and the cultural constitution of development. In L. T. Winegar & J. Valsiner (Eds.), *Children's development within social context: Vol. 2. Research and methodology* (pp. 5–31). Hillsdale, NJ: Erlbaum.

Cole, M. (1995). Culture and cognitive development: From cross-cultural research to creating systems of cultural mediation. *Culture and Psychology, 1*(1), 25–54.

Cook, G. (1993). *George Herbert Mead: The making of a social pragmatist.* Urbana: University of Illinois Press.

Crawford, C., & Krebs, D. L. (Eds.). (1998). *Handbook of evolutionary psychology.* Mahwah, NJ: Erlbaum.

Crick, F. (1988). *What mad pursuit: A personal view of scientific discovery.* London: Penguin Books.

Csikszentmihalyi, M., & Larson, R. (1987). Validity and reliability of experience sampling method. *Journal of Nervous and Mental Diseases, 175,* 526–536.

Danziger, K. (1990). *Constructing the subject.* Cambridge, England: Cambridge University Press.

Danziger, K. (1997). *Naming the mind.* London: Sage.

Diriwächter, R. (2003, June). *What really matters: Keeping the whole.* Paper presented at the 10th Biennial Conference of International Society for Theoretical Psychology, Istanbul, Turkey.

Diriwächter, R. (2004). Völkerpsychologie: The synthesis that never was. *Culture and Psychology, 10*(1), 179–203.

Dewey, J. (1895). The theory of emotion: Pt. II. The significance of emotions. *Psychological Review, 2*(1), 13–32.

Dodds, A. E., Lawrence, J. A., & Valsiner, J. (1997). The personal and the social: Mead's theory of the "generalized other." *Theory and Psychology, 7*(4), 483–503.

Dolby, R. G. A. (1977). The transmissions of two new scientific disciplines from Europe to North America in the late 19th century. *Annals of Science, 34,* 287–310.

Eckensberger, L. H. (1995). Activity or action: Two different roads towards an integration of culture into psychology? *Culture and Psychology, 1*(1), 67–80.

Eckensberger, L. H. (1997). The legacy of Boesch's intellectual oeuvre. *Culture and Psychology, 3*(3), 277–298.

Eckensberger, L. H. (2003). Wanted: A contextualized psychology. In T. S. Saraswathi (Ed.), *Cross-cultural perspective in human development* (pp. 70–101). New Delhi, India: Sage.

Engler, R. (1968). *Ferdinand de Saussure Cours de linguistique générale: Édition critique*. Wiesbaden, Germany: Otto Harrassowitz.

Escobar, A. (1995). *Encountering development: The making and unmaking of the third world*. Princeton, NJ: Princeton University Press.

Essex, C., & Smythe, W. E. (1999). Between numbers and notions. *Theory and Psychology, 9*(6), 739–767.

Fabricius, W. V. (1983). Piaget's theory of knowledge: Its philosophical context. *Human Development, 26,* 325–334.

Fischer, K. W. (1980). A theory of cognitive development: The control and construction of hierarchies of skill. *Psychological Review, 87,* 477–531.

Fischer, K. W., & Bidell, T. R. (1998). Dynamic development of psychological structures in action and thought. In W. Damon (Editor-in-Chief) & R. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 467–562). New York: Wiley.

Fischer, K. W., Bullock, D. H., Rotenberg, E. J., & Raya, P. (1993). The dynamics of competence: How context contributes directly to skill. In R. H. Wozniak & K. W. Fischer (Eds.), *Development in context* (pp. 93–117). Hillsdale, NJ: Erlbaum.

Fischer, K. W., & Ferrar, M. J. (1987). Generalizations about generalization: How a theory of skill development explains both generality and specificity. *International Journal of Psychology, 22,* 643–677.

Fischer, K. W., & Ferrar, M. J. (1992). Generalizations about generalizations: How a theory of skill development explains both generality and specificity. In A. Demetriou, M. Shayer, & A. Efklides (Eds.), *Neo-Piagetian theories of cognitive development* (pp. 137–172). London: Routledge.

Fischer, K. W., Yan, Z., & Stewart, J. (2003). Adult cognitive development: Dynamics in the developmental web. In J. Valsiner & K. J, Connolly (Eds.), *Handbook of developmental psychology* (pp. 491–516). London: Sage.

Fogel, A. (1993). *Developing through relationships*. Chicago: University of Chicago Press.

Fogel, A. (1999). Systems, cycles, and developmental pathways. *Human Development, 42,* 213–216.

Fogel, A., & Branco, A. U. (1997). Meta-communication as a source of indeterminism in relationships. In A. Fogel, M. Lyra, & J. Valsiner (Eds.), *Dynamics and indeterminism in developmental and social processes* (pp. 65–92). Hillsdale, NJ: Erlbaum.

Ford, D. H., & Lerner, R. M. (1992). *Developmental systems theory*. Newbury Park, CA; Sage.

Gigerenzer, G. (1993). The superego, the ego, and the id in statistical reasoning. In G. Keren & C. Lewis (Eds.), *A handbook for data analysis in the behavioral sciences: Methodological issues* (pp. 311–339). Hillsdale, NJ: Erlbaum.

Gigerenzer, G., Swijtink, Z., Porter, T., Daston, L., Beatty, J., & Krüger, L. (1989). *The empire of chance*. Cambridge, England: Cambridge University Press.

Gillespie, A. (2003). Supplementarity and surplus: Moving between the dimensions of otherness. *Culture and Psychology, 9*(3), 209–220.

Goldstein, K. (1933). L'analyse de l'aphasie et l'étude de l'essence du langage. *Journal de Psychologie, 30,* 430–496.

Goldstein, K. (1971). Concerning the concept of "primitivity." In A. Gurwitsch, E. M. Goldstein Haudek, & W. Haudek (Eds.), *Selected papers of Kurt Goldstein* (pp. 485–503). Den Haag, The Netherlands: Martinus Nijhoff.

Gottlieb, G. (1992). *Individual development and evolution: The genesis of novel behavior*. New York: Oxford University Press.

Gottlieb, G. (1997). *Synthesizing nature/nurture*. Mahwah, NJ: Erlbaum.

Gottlieb, G. (1999). *Probabilistic epigenesis and evolution: The 23rd Heinz Werner Lecture*. Worcester, MA: Clark University Press.

Gottlieb, G. (2003). Probabilistic epigenesis of development. In J. Valsiner & K. J. Connolly (Eds.), *Handbook of developmental psychology* (pp. 3–17). London: Sage.

Gottmann, J. M., Murray, J. D., Swanson, C. C., Tyson, R., & Swanson, K. R. (2002). *The mathematics of marriage: Dynamic nonlinear models*. Cambridge, MA: MIT Press.

Guerra, G. (2003). Autonomy and constructivism. *European Journal of School Psychology, 1*(1), 97–118.

Gurwitsch, A. (1922). Über den Begriff des embryonalen Feldes. *Archiv für Entwicklungsmechanik der Organismen, 51,* 383–415.

Hall, G. S. (1883). *The study of children*. Somerville, MA: Private publication.

Herbst, D. (1995). What happens when we make a distinction: An elementary introduction to co-genetic logic. In T. Kindermann & J. Valsiner (Eds.), *Development of person-context relations* (pp. 67–79). Hillsdale, NJ: Erlbaum.

Hermans, H. J. M. (1995). The limitations of logic in defining the self. *Theory and Psychology, 5*(3), 375–382.

Hermans, H. J. M. (2001). The dialogical self: Toward a theory of personal and cultural positioning. *Culture and Psychology, 7*(3), 243–281.

Hermans, H. J. M. (Ed.). (2002). Special issue on dialogical self. *Theory and Psychology, 12*(2), 147–280.

Hermans, H. J. M. (2003). Clinical diagnosis as a multiplicity of self-positions: Challenging social representations theory. *Culture and Psychology, 9*(4), 407–414.

Hirata, S., Watanabe, K., & Kawai, M. (2001). "Sweet-potato washing" revisited. In T. Matsuzawa (Ed.), *Primate origins of human cognition and behavior* (pp. 487–508). Tokyo: Springer.

Hooker, C. A. (1994). Regulatory constructivism: On the relation between evolutionary epistemology and Piaget's genetic epistemology. *Biology and Philosophy, 9,* 197–244.

Hundeide, K. (2005). Socio-cultural tasks of development, opportunity situations, and access skills. *Culture and Psychology, 11*(2), 241–261.

Imanishi, K. (2002). *The world of living things*. London: Routledge. (Original work published 1941)

Jahoda, G. (1993). *Crossroads between culture and mind*. Cambridge, MA: Harvard University Press.

Jahoda, G. (1995). The ancestry of a model. *Culture and Psychology, 1*(1), 11–24.

Janet, P. (1889). *L'automatisme psychologique: Essai de psychologie expérimentale sur les formes inférieures de l'activité humaine*. Paris: Félix Alcan.

Janet, P. (1921). The fear of action. *Journal of Abnormal Psychology and Social Psychology, 16*(2/3), 150–160.

Janet, P. (1925). *Psychological healing* (Vol. 1). New York: Macmillan.

Janet, P. (1926). *De l'angoisse a l'extase: Un délire religieux la croyance* (Vol. 1). Paris: Félix Alcan.

Janet, P. (1928). *De l'angoisse a l'extase: Un délire religieux la croyance: Vol. 2. Les sentiments fondamentaux*. Paris: Félix Alcan.

Jantsch, E. (1980). *The self-organizing universe.* Oxford, England: Pergamon Press.

Joas, H. (1985). *G. H. Mead: A contemporary re-examination of his thought.* Cambridge, MA: MIT Press.

Josephs, I. E. (1998). Constructing one's self in the city of the silent: Dialoguer, symbols, and the role of "as if" in self development. *Human Development, 41,* 180–195.

Kagitcibasi, C. (2003). Human development across cultures: A contextual-functional analysis and implications for intervention. In T. S. Saraswathi (Ed.), *Cross-cultural perspective in human development* (pp. 166–191). New Delhi, India: Sage.

Kawamura, S. (1959). The process of sub-culture propagation among Japanese macaques. *Primates, 2*(1), 43–51.

Kindermann, T., & Valsiner, J. (1989). Research strategies in culture-inclusive developmental psychology. In J. Valsiner (Ed.), *Child development in cultural context* (pp. 13–50). Toronto, Ontario, Canada: Hogrefe & Huber.

Kirschner, S. R. (2003). On the varieties of intersubjective experience. *Culture and Psychology, 9*(3), 277–286.

Knorr Cetina, K. (1999). *Epistemic cultures.* Cambridge, England: Cambridge University Press.

Kojima, H. (1995). Forms and functions as categories of comparison. *Culture and Psychology, 1*(1), 139–145.

Krebs, H. A. (1964). *The citric acid cycle: Nobel lectures, physiology or medicine 1942–1962* (pp. 399–410). Amsterdam: Elsevier.

Krewer, B. (1992). *Kulturelle Identität und menschliche Selbsterforschung.* Saarbrücken, Germany: Breitenbach.

Krueger, F. (1915). Über Entwicklungspsychologie. *Arbeiten zur Entwicklungspsychologie, 1*(1), 1–232. Leipzig, Germany: Wilhelm Engelmann.

Kubey, R., & Csikszentmihalyi, M. (1981). The experience sampling method. *Public Opinion Quarterly, 45,* 317–328.

Laboratory of Comparative Human Cognition. (1983). Culture and cognitive development. In W. Kessen (Ed.), *Handbook of child psychology: Vol. 1. History, theory, and methods* (pp. 295–356). New York: Wiley.

Laird, J. L. (2005). A microgenetic developmental perspective on statistics and measurement. In R. Bibace, J. Laird, K. Noller, & J. Valsiner (Eds.), *Science and medicine in dialogue* (pp. 221–229). Stamford, CT: Greenwood.

Lane, J., Magovcevic, M., & Solomon, B. (2005). The Clark years: Creating a culture In J. Valsiner (Ed.), *Heinz Werner and developmental science* (pp. 181–200). New York: Kluwer Press.

Lamiell, J. T. (2003). *Beyond individual and group differences: Human individuality, scientific psychology, and William Stern's critical personalism.* Thousand Oaks, CA: Sage.

Langer, J. (1970). Werner's comparative organismic theory. In P. H. Mussen (Ed.), *Carmichael's Handbook of Child Psychology* (3rd ed., pp. 733–771). New York: Wiley.

Leont'ev, A. N. (1981). The problem of activity in psychology. In J. V. Wertsch (Ed.), *The concept of activity in Soviet psychology* (pp. 37–71). Armonk, NY: Sharpe.

Lerner, R. M. (1978). Nature, nurture, and dynamic interactionism. *Human Development, 21,* 1–20.

Lerner, R. M. (1984). *On the nature of human plasticity.* Cambridge, England: Cambridge University Press.

Lerner, R. M. (1990). Plasticity, person-context relations, and cognitive training in the aged years: A developmental contextual perspective. *Developmental Psychology, 26*(6), 911–915.

Lerner, R. M. (1991). Changing organism-context relations as the basic process of development. *Developmental Psychology, 27,* 27–32.

Lerner, R. M. (1995). The place of learning within the human development system: A developmental contextual perspective. *Human Development, 38,* 361–366.

Lerner, R. M., Jacobs, F., & Wertlieb, D. (Eds.). (2003). *Handbook of applied developmental science* (Vols. 1–4). Thousand Oaks, CA: Sage.

Lewin, K. (1927). Gesetz und Experiment in der Psychologie. *Symposion, 1,* 375–421.

Lewin, K. (1931). The conflict between Aristotelian and Galileian modes of thought in contemporary psychology. *Journal of General Psychology, 5,* 141–177.

Lewin, K. (1933). Environmental forces. In C. Murchison (Ed.), *A handbook of child psychology* (2nd ed., pp. 590–625). Worcester, MA: Clark University Press.

Lewin, K. (1935). Psycho-sociological problems of a minority group. *Character and Personality, 3,* 175–187.

Lewin, K. (1936a). *Principles of topological psychology.* New York: McGraw-Hill.

Lewin, K. (1936b). Some social-psychological differences between the United States and Germany. *Character and Personality, 4,* 265–293.

Lewin, K. (1938). *The conceptual representation and the measurement of psychological forces.* Durham, NC: Duke University Press.

Lewin, K. (1939). Field theory and experiment in social psychology: Concepts and methods. *American Journal of Sociology, 44,* 868–896.

Lewin, K. (1942). Field theory and learning. In N. B. Henry (Ed.), *The forty-first yearbook of the National Society for the Study of Education: Pt. II. The psychology of learning* (pp. 215–242). Bloomington, IN: Public School Publishing.

Lewin, K. (1943). Defining the field at a given time. *Psychological Review, 50,* 292–310.

Lewis, M. D. (1995). Cognition-emotion feedback and the self-organization of developmental paths. *Human Development, 38,* 71–102.

Lewis, M. D. (2000). The promise of dynamic systems approaches for an integrated account of human development. *Child Development, 71*(1), 36–43.

Lewis, M. D. (2005). Bridging emotion theory and neurobiology through dynamic systems modeling. *Behavioral and Brain Sciences, 28,* 169–245.

Lickliter, R., & Honeycutt, H. (2003a). Developmental dynamics: Toward a biologically plausible evolutionary psychology. *Psychological Bulletin, 129*(6), 819–935.

Lickliter, R., & Honeycutt, H. (2003b). Developmental dynamics and contemporary evolutionary psychology. *Psychological Bulletin, 129*(6), 866–872.

Lightfoot, C. (1997). *The culture of adolescent risk-taking.* New York: Guilford Press.

Lipps, T. (1903). Einfühlung, inner Nachahmung, und Organ-emfindungen. *Archiv für die gesamte Psychologie, 2,* 185–204.

Lipps, T. (1923). *Aesthetik.* Leipzig, Germany: Barth.

Lotman, J. M. (1992). O semiosfere. In J. M. Lotman. *Izbrannye stat'i: Vol. 1. Stat'i po semiotike i tipologii kul'tury* (pp. 11–24). Tallinn, Estonia: Aleksandra.

Lyra, M. C. D. P. (1999). An excursion into the dynamics of dialogue. *Culture and Psychology, 5*(4), 477–489.

Lyra, M. C. D. P., Pantoja, A. P., & Cabral, E. A. (1991, August). *A diferenciação da produção vocal do bebê nas interações mãe-*

objeto-bebê. Paper presented at 43rd Meeting of the Sociedade Brasileira para o Progresso da Ciência, Rio de Janeiro, Brazil.

Lyra, M. C. D. P., & Rossetti-Ferreira, M. C. (1995). Transformation and construction in social interaction: A new perspective of analysis of the mother-infant dyad. In J. Valsiner (Ed.), *Child development in culturally structured environments: Vol. 3. Comparative-cultural and constructivist perspectives* (pp. 51–87). Norwood, NJ: Ablex.

Lyra, M. C. D. P., & Winegar, L. T. (1997). Processual dynamics of interaction through time: Adult-child interactions and process of development. In A. Fogel, M. Lyra, & J. Valsiner (Eds.), *Dynamics and indeterminism in developmental and social processes* (pp. 93–109). Hillsdale, NJ: Erlbaum.

Maciel, D. A., Branco, A. U., & Valsiner, J. (2004). Bi-directional process of knowledge construction in teacher-student transaction. In A. U. Branco & J. Valsiner (Eds.), *Metacommunication and communication in human development* (pp. 109–125). Stamford, CT: InfoAge Press.

Magnusson, D. (1988). *Individual development from an interactional perspective.* Hillsdale, NJ: Erlbaum.

Magnusson, D., & Cairns, R. B. (1996). Developmental science: Toward a unified framework. In R. B. Cairns, G. Elder, & E. J. Costello (Eds.), *Developmental science* (pp. 7–30). New York: Cambridge University Press.

Matsuzawa, T. (Ed.). (2001). *Primate origins of human cognition and behavior.* Tokyo: Springer.

Matsuzawa, T., Biro, D., Humle, T., Inoue-Nakamura, N., Tonooka, R., & Yamakoshi, G. (2001). Emergence of culture in wild chimpanzees: Education of master-apprenticeship. In T. Matsuzawa (Ed.), *Primate origins of human cognition and behavior* (pp. 557–574). Tokyo: Springer.

Maturana, H. (1980). Autopoiesis: Reproduction, heredity and evolution. In M. Zeleny (Ed.), *Autopoiesis, dissipative structures, and spontaneous social orders* (pp. 45–79). Boulder, CO: Westview Press.

Mead, G. H. (1913). The social self. *Journal of Philosophy, 10,* 374–380.

Meigs, A. (1990). Multiple gender ideologies and statuses. In P. R. Sanday & R. G. Goodenough (Eds.), *Beyond the second sex: New directions in the anthropology of gender* (pp. 101–112). Philadelphia: University of Pennsylvania Press.

Mernissi, F. (1994). *Dreams of trespass: Tales of a harem girlhood.* Cambridge, MA: Perseus Books.

Mey, G. (Ed.). (2005). *Qualitative Forschung in der Entwicklungspsychologie.* Köln, Germany: Kölner Studien Verlag.

Meyerson, I. (1947). Pierre Janet et la théorie des tendances. *Journal de Psychologie, 40,* 5–19.

Michell, J. (1999). *Measurement in psychology: Critical history of a methodological concept.* Cambridge, England: Cambridge University Press.

Minch, E. (1998). The beginning of the end: On the origin of the final cause. In G. van de Vijver, S. N. Salthe, & M. Deplos (Eds.), *Evolutionary synthesis* (pp. 45–58). Dordrecht, The Netherlands: Kluwer Press.

Moessinger, P. (1978). Piaget on equilibration. *Human Development, 21,* 255–267.

Moghaddam, F. M. (2003). Interobjectivity and culture. *Culture and Psychology, 9*(3), 221–232.

Molenaar, P. C. M. (2004). A manifesto on psychology as idiographic science: Bringing the person back into scientific psychology, this time forever. *Measurement: Interdisciplinary Research and Perspectives, 2,* 201–218.

Molenaar, P. C. M., Huizenga, H. M., & Nesselroade, J. R. (2003). The relationship between the structure of inter-individual and intra-individual variability. In U. Staudinger & U. Lindenberger (Eds.), *Understanding human development* (pp. 339–360). Dordrecht, The Netherlands: Kluwer Press.

Moreno, A., & Umerez, J. (2000). Downward causation at the core of living organization. In P. B. Andersen, C. Emmeche, N. O. Finnemann, & P. V. Christiansen (Eds.), *Downward causation: Minds, bodies, and matter* (pp. 99–117). Aarhus, Denmark: Aarhus University Press.

Morgan, C. L. (1894). *An introduction to comparative psychology.* London: Walter Scott.

Morgan, C. L. (2003). Other minds than ours. *From Past to Future, 4*(1), 11–23.

Moshman, D. (1998). Cognitive development beyond childhood. In W. Damon (Editor-in-Chief) & D. Kuhn & R. Siegler (Vol. Eds.), *Handbook of child psychology: Vol. 2. Cognition, perception, and language* (5th ed., pp. 947–978). New York: Wiley.

Nesselroade, J. R., & Molenaar, P. C. M. (2003). Quantitative models for developmental processes. In J. Valsiner & K. J. Connolly (Eds.), *Handbook of developmental psychology* (pp. 622–639). London: Sage.

Newman, D., Griffin, P., & Cole, M. (1989). *The construction zone: Working for cognitive change in school.* Cambridge, England: Cambridge University Press.

Nicolis, G. (1993). Nonlinear dynamics and evolution of complex systems. In J. Montangero, A. Cornu-Wells, A. Tryphon, & J. Voneche (Eds.), *Conceptions of change over time* (pp. 17–31). Geneve, Switzerland: Foundation Archives Jean Piaget.

Nieuwenhuys, O. (2003). The paradox of child labour and anthropology. In V. Das (Ed.), *The Oxford India companion to sociology and social anthropology* (Vol. 2, pp. 940–955). New York: Oxford University Press.

Obeyesekere, G. (1990). *The work of culture.* Chicago: University of Chicago Press.

Oliveira, Z. M. R. (1997). The concept of "role" and the discussion of the internalization process. In B. Cox & C. Lightfoot (Eds.), *Sociogenetic perspectives on internalization* (pp. 105–118). Hillsdale, NJ: Erlbaum.

Oliveira, Z. M. R., & Valsiner, J. (1997). Play and imagination: The psychological construction of novelty. In A. Fogel, M. Lyra, & J. Valsiner (Eds.), *Dynamics and indeterminism in developmental and social processes* (pp. 119–133). Hillsdale, NJ: Erlbaum.

Oyama, S. (1985). *The ontogeny of information.* Cambridge, England: Cambridge University Press.

Pascual-Leone, J. (1976). A view of cognition from a formalist perspective. In K. Riegel & J. Meacham (Eds.), *The developing individual in a changing world* (pp. 89–100). The Hague, The Netherlands: Mouton.

Peirce, C. S. (1892). Man's glassy essence. *The Monist, 2,* 1–22.

Peirce, C. S. (1935). *Collected papers of Charles Sanders Peirce.* Cambridge, MA: Harvard University Press.

Penuel, W., & Wertsch, J. (1995). Dynamics of negation in the identity politics of cultural other and cultural self. *Culture and Psychology, 1*(3), 343–359.

Perret-Clermont, A.-N., Pontecorvo, C., Resnick, L. B., Zittoun, T., & Burge, B. (Eds.). (2004). *Joining society: Social interaction and*

learning in adolescence and youth. Cambridge, England: Cambridge University Press.

Piaget, J. (1922). Essai sur la multiplication logique et les débuts de la pensée formelle chez l'enfant. *Journal de Psychologie, 19,* 222–261.

Piaget, J. (1952). Jean Piaget. In E. G. Boring, H. Werner, H. S. Langfeld & R. M. Yerkes (Eds.), *A history of psychology in autobiography* (Vol. 4, pp. 237–256). Worcester, MA: Clark University Press.

Piaget, J. (1965). Psychology and philosophy. In B. B. Wolman & E. Nagel (Eds.), *Scientific psychology: Principles and approaches* (pp. 28–43). New York: Basic Books.

Piaget, J. (1970a). *Epistémologie des sciences de l'homme.* Paris: Gallimard.

Piaget, J. (1970b). Piaget's theory. In P. Mussen (Ed.), *Carmichael's handbook of child psychology* (pp. 703–732). New York: Wiley.

Piaget, J. (1971a). *Insights and illusions of philosophy.* London: Routledge & Kegan Paul.

Piaget, J. (1971b). *Biology and knowledge.* Chicago: University of Chicago Press.

Piaget, J. (1977). *The development of thought: Equilibration of cognitive structures.* New York: Viking.

Piaget, J. (1986). Essay on necessity. *Human Development, 29,* 301–314.

Piaget, J., & Voyat, G. (1979). The possible, the impossible, and the necessary. In F. B. Murray (Ed.), *The impact of Piagetian theory on education, philosophy, psychiatry, and psychology* (pp. 65–85). Baltimore: University Park Press.

Poddiakov, A. N. (2001). Counteraction as a crucial factor of learning, education and development: Opposition to help. *Forum Qualitative Sozialforschung/Forum: Qualitative Social Research, 2*(3). Available from http://www.qualitative-research.net/fqs-texte/3–01/3–01poddiakov-e.htm.

Poddiakov, A. N. (2005). Coping with problems created by others: directions of development. *Culture and psychology, 11*(2), 227–240.

Prigogine, I. (1973). Irreversibility as a symmetry-breaking process. *Nature, 246,* 67–71.

Riegel, K. (1975). Toward a dialectical theory of development. *Human Development, 18,* 50–64.

Riegel, K. (1976). The dialectics of human development. *American Psychologist, 31,* 689–700.

Rogers, S. C. (1975). Female forms of power and the myth of male dominance: A model of female/male interaction in a peasant society. *American Ethnologist, 2,* 727–756.

Rogoff, B. (1990). *Apprenticeship in thinking.* New York: Oxford University Press.

Rogoff, B. (1992). Three ways of relating person and culture: Thoughts sparked by Valsiner. *Human Development, 35*(5), 316–320.

Rogoff, B. (1993). Children's guided participation and participatory appropriation in sociocultural activity. In R. H. Wozniak & K. W. Fischer (Eds.), *Development in context* (pp. 121–153). Hillsdale, NJ: Erlbaum.

Rogoff, B. (2003). *The cultural nature of human development.* New York: Oxford University Press.

Rogoff, B., & Lave, J. (Eds.). (1984). *Everyday cognition.* Cambridge, MA: Harvard University Press.

Rosa, A. (1993). *Frederick Charles Bartlett: Descripcion de su obra y analisis de su primera postura respecto de las relaciones entre psicologia y antropologia.* Unpublished manuscript, Universidad Autonoma de Madrid.

Ross, D. (1993). An historian's view of American social science. *Journal of the History of the Behavioral Sciences, 29*(2), 99–11.

Rossetti-Ferreira, M. C., Amorim, K., Soares da Silva, A. P., & Carvalho, A. A. (Eds.). (2004). *Rede de significações e o studio do desenvolvimento humano.*Porto Alegre, Portugal: ArtMed Editora.

Rowell, J. A. (1983). Equilibration: Developing the hard core of the Piagetian research program. *Human Development, 26,* 61–71.

Rudolph, L. (2006). Spaces of ambivalence: Qualitative mathematics in the modeling of complex fluid phenomena. *Estudios de Psicologia.*

Rutter, M. (2003). Commentary: Causal processes leading to antisocial behavior. *Developmental Psychology, 39*(2), 372–378.

Salvatore, S., & Pagano, P. (2005). Issues of cultural analysis. *Culture and Psychology, 11*(2), 159–180.

Sarris, E. G. (1931). *Sind wir berechtigt, vom Wortverständis des Hundes zu sprechen?* Leipzig, Germany: Barth.

Schütz, A., & Luckmann, T. (1973). *The structures of the life-world.* Evanston, IL: Northwestern University Press.

Scribner, S., & Cole, M. (1981). *The psychology of literacy.* Cambridge, MA: Harvard University Press.

Sewertzoff, A. (1929). Direction of evolution. *Acta zoologica, 10,* 59–141.

Shanahan, M., Valsiner, J., & Gottlieb, G. (1996). The conceptual structure of developmental theories. In J. Tudge, M. Shanahan, & J. Valsiner (Eds.), *Comparative approaches in developmental science* (pp. 13–71). New York: Cambridge University Press.

Shostak, M. (1981). *Nisa: The life and words of a* Kung woman. Cambridge, MA: Harvard University Press.

Shweder, R. A. (1991). *Thinking through cultures.* Cambridge, MA: Harvard University Press.

Shweder, R. A. (1995). The confessions of a methodological individualist. *Culture and Psychology, 1, 1,* 115–122.

Shweder, R. A., & Sullivan, M. A. (1990). The semiotic subject of cultural psychology. In L. Pervin (Ed.), *Handbook of personality* (pp. 399–416). New York: Guilford Press.

Shweder, R. A., & Sullivan, M. A. (1993). Cultural psychology: Who needs it? *Annual Review of Psychology, 44,* 497–523.

Simão, L. M. (2003). Beside rupture: Disquiet; beyond the other—Alterity. *Culture and Psychology, 9*(4), 449–459.

Simão, L. M. (2005). Bildung, culture and self. *Theory and Psychology, 15*(4), 549–574.

Simmel, G. (1906). The sociology of secrecy and of secret societies. *American Journal of Sociology, 11*(4), 441–498.

Simmel, G. (1908). Vom Wesen der Kultur. *Österreichische Rundschau, 15,* 36–42.

Simon, H. (1999). Karl Duncker and cognitive science. *From Past to Future, 1*(2), 1–11.

Sjövall, B. (1967). *Psychology of tension.* Nordstets, Germany: Svenska Bokförlaget.

Slunecko, T. (2002). *Von der Konstruktion zur dynamischen Konstitution.* Wien: Wiener Universitäts Verlag.

Smedslund, J. (1994). What kind of propositions are set forth in developmental research? Five case studies. *Human Development, 37,* 280–292.

Smedslund, J. (1995). Psychologic: Common sense and the pseudoempirical. In J. A. Smith, R. Harré, & L. van Langenhove (Eds.), *Rethinking psychology* (pp. 196–206). London: Sage.

Smith, L. B., & Thelen, E. (Eds.). (1993). *A dynamic systems approach to development.* Cambridge, MA: MIT Press.

Smyth, M. (2001). Fact making in psychology: The voice of the introductory textbook. *Theory and Psychology, 11*(5), 609–636.

Smythe, W. E. (2005). On the psychology of "as if." *Theory and Psychology, 15*(3), 283–303.

Sovran, T. (1992). Between similarity and sameness. *Journal of Pragmatics, 18*(4), 329–344.

Spencer, H. (1864). *First principles.* London.

Stearns, P. N., & Lewis, J. (Eds.). (1998). *An emotional history of the United States.* New York: NYU Press.

Stratton, P. (2003). Contemporary families as contexts for development. In J. Valsiner & K. J, Connolly (Eds.), *Handbook of developmental psychology* (pp. 333–357). London: Sage.

Strout, S. (2006). Sex in the city: The ambiguity of female mating strategies. *Estudios de Psicologia.*

Thorngate, W. (1986). The production, detection, and explanation of behavioural patterns. In J. Valsiner (Ed.), *The individual subject and scientific psychology* (pp. 71–93). New York: Plenum Press.

Thorngate, W. (1992). Evidential statistics and the analysis of developmental patterns. In J. Asendorpf & J. Valsiner (Eds.), *Stability and change in development* (pp. 63–83). Newbury Park, CA: Sage.

Toomela, A. (Ed.). (2003). *Cultural guidance in the development of the human mind.* Westport, CT: Ablex.

Vaihinger, H. (1920). *Die Philosophie des als ob: System der theoretischen, praktischen und religiösen Fiktionen der Menschheit* (4th ed.). Leipzig, Germany: Felix Meiner.

Valsiner, J. (1984). Two alternative epistemological frameworks in psychology: The typological and variational modes of thinking. *Journal of Mind and Behavior, 5*(4), 449–470.

Valsiner, J. (Ed.). (1986). *The individual subject and scientific psychology.* New York: Plenum Press.

Valsiner, J. (1987). *Culture and the development of children's action.* Chichester, England: Wiley.

Valsiner, J. (1988). *Developmental psychology in the Soviet Union.* Brighton, England: Harvester.

Valsiner, J. (1989). Collective coordination of progressive empowerment. In L. T. Winegar (Ed.), *Social interaction and the development of children's understanding* (pp. 7–20). Norwood, NJ: Ablex.

Valsiner, J. (1997). *Culture and the development of children's action* (2nd ed.). New York: Wiley.

Valsiner, J. (1998a). The development of the concept of development: Historical and epistemological perspectives. In W. Damon (Editor-in-Chief) & R. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 189–232). New York: Wiley.

Valsiner, J. (1998b). The pleasure of thinking: A glimpse into Karl Bühler's life. *From past to future: Clark Papers on the History of Psychology, 1*(1), 15–35.

Valsiner, J. (2000a). Entre a "Democracia da Literatura" e a paixao pela compreensão: Entendendo a dinâmica do desenvolvimento. *Psicologia: Reflexão e critica, 13*(2), 319–325.

Valsiner, J. (2000b). Data as representations: Contextualizing qualitative and quantitative research strategies. *Social Science Information, 39*(1), 99–113.

Valsiner, J. (2000c). *Culture and human development.* London: Sage.

Valsiner, J. (2001a). *Comparative study of human cultural development.* Madrid, Spain: Fundacion Infancia y Aprendizaje.

Valsiner, J. (2001b). Process structure of semiotic mediation in human development. *Human Development, 44,* 84–97.

Valsiner, J. (2001c). The first six years: Culture's adventures in psychology. *Culture and Psychology, 7*(1), 5–48.

Valsiner, J. (2003a). Comparative methodology as the human condition: Conway Lloyd Morgan and the use of animal models in science. *From Past to Future, 4*(1), 1–9.

Valsiner, J. (2003b). Culture and its transfer: Ways of creating general knowledge through the study of cultural particulars. In W. J. Lonner, D. L. Dinnel, S. A. Hayes, & D. N. Sattler (Eds.), *Online readings in psychology and culture* (Unit 2, Chap. 12). Washington, DC: Western Washington University, Center for Cross-Cultural Research, Bellingham. Available from http://www.wwu.edu/~culture.

Valsiner, J. (2003c, June). *Theory construction and theory use in psychology: Creating knowledge beyond social ideologies.* Keynote presentation at the 10th Biennial Conference of International Society for Theoretical Psychology (ISTP), Istanbul, Turkey.

Valsiner, J. (2003d, December). *Missions in history and history through a mission: Inventing better worlds for humankind.* The First Annual Casimir Lecture on the Studies in History of Education, Leiden University, The Netherlands.

Valsiner, J. (2004a, September 11). *Transformations and flexible forms: Where qualitative psychology begins.* Keynote lecture at the Inaugural Conference of the Japanese Association of Qualitative Psychology, Kyoto, Japan.

Valsiner, J. (Ed.). (2005a). *Heinz Werner and developmental science.* New York: Plenum Press.

Valsiner, J. (2005b). *Attractors, repulsors, and directors: Making dynamic systems theory developmental* (Sapporo, No. 27, 13–25). Annual Report 2003–2004 of Research and Clinical Center for Child Development, Hokkaido University, Japan, Graduate School of Education.

Valsiner, J., & Cairns, R. B. (1992). Theoretical perspectives on conflict and development. In C. U. Shantz & W. W. Hartup (Eds.), *Conflict in child and adolescent development* (pp. 15–35). Cambridge, England: Cambridge University Press.

Valsiner, J., & Connolly, K. J. (2003). The nature of development: The continuing dialogue of processes and outcomes. In J. Valsiner & K. J. Connolly (Eds.), *Handbook of developmental psychology* (pp. ix–xviii). London: Sage.

Valsiner, J., & Diriwächter, R. (2005). Qualitative Forschungsmethoden in historischen und epistemologischen Kontexten In G. Mey (Ed.), *Qualitative Forschung in der Entwicklungspsychologie* (pp. 35–55). Köln, Germany: Kölner Studien Verlag.

Valsiner, J., Diriwächter, R., & Sauck, C. (2004). Diversity in unity: Standard questions and non-standard interpretations. In R. Bibace, J. Laird, K. Noller & J. Valsiner (Eds.), *Science and medicine in dialogue* (pp. 289–307). Stamford, CT: Greenwood Press.

Valsiner, J., & Sato, T. (2006). Whom to study in cultural psychology: From random to historically structured sampling. In J. Straub, C. Kölbl, D. Weidemann, & B. Zielke (Eds.), *Pursuit of meaning: Theoretical and methodological advances cultural and cross-cultural psychology.* Bielefeld, Germany: Transcript.

Valsiner, J., & van der Veer, R. (1993). The encoding of distance: The concept of the zone of proximal development and its interpretations. In R. R. Cocking & K. A. Renninger (Eds.), *The development and meaning of psychological distance* (pp. 35–62). Hillsdale, NJ: Erlbaum.

Valsiner, J., & van der Veer, R. (2000). *The social mind.* New York: Cambridge University Press.

van der Veer, R., & Valsiner, J. (1991). *Understanding Vygotsky: A quest for synthesis.* Oxford, England: Basil Blackwell.

van der Veer, R., & Valsiner, J. (1994). *Vygotsky Reader.* Oxford, England: Basil Blackwell.

van Geert, P. (Ed.). (1986). *Theory building in developmental psychology.* Amsterdam: North Holland.

van Geert, P. (1988). The concept of transition in developmental theories. In W. J. Baker, L. P. Mos, H. V. Rappard & H. J. Stam (Eds.), *Recent trends in theoretical psychology* (pp. 225–235). New York: Springer.

van Geert, P. (1998). We almost had a great future behind us: The contribution of non-linear dynamics to developmental-science-in-the-making. *Developmental Science, 1,* 143–159.

van Geert, P. (2003). Dynamic systems approaches and modeling of developmental processes. In J. Valsiner & K. J. Connolly (Eds.), *Handbook of developmental psychology* (pp. 640–673). London: Sage.

Villenas, S., & Moreno, M. (2001). To valerse por si mesma between race, capitalism, and patriarchy: Latina mother-daughter pedagogies in North Carolina. *Qualitative Studies in Education, 14*(5), 671–687.

von Baer, K. (1828). *Über Entwicklungsgeschichte der Thiere: Beobactung und reflexion.* Königsberg, Germany: Bornträger.

von Ehrenfels, C. (1988). On Gestalt qualities. In B. Smith (Ed.), *Foundations of Gestalt theory* (pp. 121–123). München, Germany: Philosophia Verlag. (Original work published 1932)

Von Uexküll, J. J. (1957). A stroll through the worlds of animals and men. In C. H. Schiller & K. Lashley (Eds.), *Instinctive behavior* (pp. 5–80). New York: International Universities Press.

Vuyk, R. (1981). *Overview and critique of Piaget's genetic epistemology, 1965–1980* (Vols. 1–2). London: Academic Press.

Vygotsky, L. S. (1966). Play and its role in the mental development of the child. *Voprosy psikhologii, 12*(6), 62–76. In English translation. In J. Bruner, A. Jolly, & K. Sylva (Eds.), *Play* (pp. 537–554). Harmondsworth, England: Penguin. (Original work published 1933.)

Vygotsky, L. S. (1971). *Psychology of art.* Cambridge, MA: MIT Press. (Original work published 1925 in Russian)

Vygotsky, L. S. (1982). Istoricheskii smysl krizisa v psikhologii. In *Sobranie sochinenii* (Vol. 1). Moscow, Russia: Pedagogika. (Original work published 1927)

Vygotsky, L. S. (1986). *Thought and language* (2nd ed.). Cambridge, MA: MIT Press.

Waddington, C. (1966). Fields and gradients. In M. Locke (Ed.), *Major problems in developmental biology* (pp. 105–124). New York: Academic Press.

Waddington, C. (1970). Concepts and theories of growth, development, differentiation and morphogenesis. In C. Waddington (Ed.), *Towards theoretical biology* (Vol. 1, pp. 1–41). Chicago: Aldine.

Wallon, H. (1942). *De l'act à la pensée.* Paris: Armand Colin.

Wallon, H. (1945). *Les Origines de la pensée chez l'enfant.* Paris: Presses Universitaires de France.

Watson, J. B. (1913). Psychology as the behaviorist views it. *Psychological Review, 20,* 158–176.

Weiss, P. (1969). The living system: Determinism stratified. In A. Koestler & J. Smythies (Eds.), *Beyond reductionism: New perspectives in the life sciences* (pp. 3–55). London: Hutchinson.

Weiss, P. (1978). Causality: Linear or systemic. In G. Miller & E. Lenneberg (Eds.), *Psychology and biology of language and thought.* New York: Academic Press.

Werner, H. (1926). *Einführung in die Entwicklungspsychologie.* Leipzig, Germany: Barth.

Werner, H. (1937). Process and achievement: A basic problem of education and developmental psychology. *Harvard Educational Review, 7,* 358–368.

Werner, H. (1940). *Comparative Psychology of Mental Development.* Harper & Brothers.

Werner, H. (1957). The concept of development from a comparative and organismic point of view. In D. B. Harris (Ed.), *The concept of development* (pp. 125–147). Minneapolis: University of Minnesota Press.

Werner, H., & Kaplan, B. (1956). The developmental approach to cognition: Its relevance to the psychological interpretation of anthropological and ethnolinguistic data. *American Anthropologist, 58,* 866–880.

Wertsch, J. V. (1979). From social interaction to higher psychological processes: A clarification and application of Vygotsky's theory. *Human Development, 22,* 1–22.

Wertsch, J. V. (1981). The concept of activity in Soviet psychology: An introduction. In J. V. Wertsch (Ed.), *The concept of activity in Soviet psychology* (pp. 3–36). Armonk, NY: Sharpe.

Wertsch, J. V. (1983). The role of semiosis in L. S. Vygotsky's theory of human cognition. In B. Bain (Ed.), *The sociogenesis of language and human conduct* (pp. 17–31). New York: Plenum Press.

Wertsch, J. V. (1984). The zone of proximal development: Some conceptual issues. In B. Rogoff & J. V. Wertsch (Eds.), *Children's learning in the "zone of proximal development": Vol. 23. New directions for child development* (pp. 7–17). San Francisco: Jossey-Bass.

Wertsch, J. V. (1985). *Vygotsky and the social formation of mind.* Cambridge, MA: Harvard University Press.

Wertsch, J. V. (1990). The voice of rationality in a sociocultural approach to mind. In L. C. Moll (Ed.), *Vygotsky and education* (pp. 111–126). Cambridge, England: Cambridge University Press.

Wertsch, J. V. (1991). *Voices of the mind.* Cambridge, MA: Harvard University Press.

Wertsch, J. V. (1995). Sociocultural research in the copyright age. *Culture and Psychology, 1*(1), 81–102.

Wilson, W. H., Schroeder, D. C., Allen, M. J., Holden, M. T. G., Parkhill, J., Barrell, B. G., et al. (2005). Complete genome sequence and lytic phase transcription profile of a Coccolithovirus. *Science, 309,* 1090–1092.

Winegar, L. T., & Valsiner, J. (1992). Re-contextualizing context: Analysis of metadata and some further elaborations. In L. T. Winegar & J. Valsiner (Eds.), *Children's development within social context: Vol. 2. Research and methodology* (pp. 249–266). Hillsdale, NJ: Erlbaum.

Wispé, L. (1987). History of the concept of empathy. In N. Eisenberg & J. Strayer (Eds.), *Empathy and its development* (pp. 17–37). Cambridge, England: Cambridge University Press.

Witasek, S. (1901). Zur psychologischen Analyse der ästhetischen Einfühlung. *Zeitschrift für Psychologie und Physiologie der Sinnesorgane, 25,* 1–49.

Wittgenstein, L. (1958). *Philosophical investigations.* Oxford, England: Blackwell.

Wundt, W. (1973). *The language of gestures.* The Hague, The Netherlands: Mouton. (Original work published 1900)

Zeigarnik, B. (1927). Das Behalten erledigter und unerledigter Handlungen. *Psychologische Forschung, 9,* 1–85.

Zeigarnik, B. (1981). *Teoria lichnosti Kurta Levina.* Moscow: Moscow University Press.

Zittoun, T. (2005). *Transitions: Development through symbolic resources.* Greenwich, CT: Information Age Press.

Zittoun, T., Duveen, G., Gillespie, A., Ivinson, G., & Psaltis, C. (2003). The use of symbolic resources in developmental transitions. *Culture and Psychology, 9*(4), 415–448.

CHAPTER 5

The Significance of Biology for Human Development: A Developmental Psychobiological Systems View

GILBERT GOTTLIEB, DOUGLAS WAHLSTEN, and ROBERT LICKLITER

A DEVELOPMENTAL PSYCHOBIOLOGICAL SYSTEMS VIEW: HISTORY AND CURRENT STATUS 211
The Triumph of Epigenesis over Preformation 211
The Birth of Experimental Embryology 211
Systems versus Mechanico-Reductive and Vitalistic-Constructive Viewpoints 214
Influences of Sensory Stimulation on Genetic Activity 217
The Developmental Manifold Concept 217
Developmental Causality (Coaction) 218
Significance of Coaction for Individual Development 218
The Triumph of Probabilistic Epigenesis over Predetermined Epigenesis 219
Experience Defined as Functional Activity 220
Summary of the Features of a Developmental Psychobiological Systems View 221
DEVELOPMENTAL BEHAVIOR GENETICS 221
Approaches to the Genetic Analysis of Development 221
The Nature of Heredity 225
Separating the Effects of Heredity and Environment 228
Implications of the New Molecular Biology 236
APPLICATION OF A DEVELOPMENTAL PSYCHOBIOLOGICAL SYSTEMS VIEW: THE CASE OF INTERSENSORY DEVELOPMENT 239
Traditional Approaches to Intersensory Development 240
Assumptions Underlying Traditional Approaches 241
Developmental Psychobiological Systems Approach to Intersensory Development 243
System Characteristics of Intersensory Development: Structured Organisms and Structured Environments 245
BROADER IMPLICATIONS OF A DEVELOPMENTAL PSYCHOBIOLOGICAL SYSTEMS VIEW 247
Probabilistic Epigenesis 248
SUMMARY AND CONCLUSION 248
REFERENCES 249

This chapter describes the history and current status of a psychobiological systems view of development, its implications for a developmentally oriented conception of behavior genetics, its application to a research area such as intersensory development, and the broader implications of a developmental psychobiological systems view of human development. A brief evaluation of current thinking in biology, developmental neuroscience, developmental psychobiology, and sociology is included.

Authorship of the chapter's five text sections is as follows: (1) "A Developmental Psychobiological Systems View . . ." (G. G.); (2) "Developmental Behavior Genetics . . ." (D. W.); (3) "Application . . . Intersensory Development" (R. L.); (4) "Broader Implications . . ." (G. G.); and (5) "Summary and Conclusion" (G. G.). The historical trends in the first section, leading to the current developmental systems view, are also reviewed in Gottlieb (1996). G. G.'s research and scholarly pursuits are supported in part by NIMH Grant MH-52429 and NSF Grant BCS-0126475. D. W.'s support comes from NIH Grant 2 RO1 AA012714 and OGP-45825 from the Natural Sciences and Engineering Research Council of Canada. R. L.'s research is supported in part by NIMH Grant MH-48949.

A DEVELOPMENTAL PSYCHOBIOLOGICAL SYSTEMS VIEW: HISTORY AND CURRENT STATUS[1]

The current definition of *epigenesis* holds that individual development is characterized by an increase in novelty and complexity of organization over time—the sequential emergence of new structural and functional properties and competencies—at all levels of analysis as a consequence of horizontal and vertical coactions among its parts, including organism-environment coactions (Gottlieb, 1991). Our present understanding of the various defining features of epigenesis has been laboriously worked out over the past 200 years.

The Triumph of Epigenesis over Preformation

The triumph of epigenesis over the concept of preformation ushered in the era of truly developmental thinking. Namely, that to understand the origin of any phenotype it is necessary to study its development in the individual. This insight has been with us since at least the beginning of the 1800s, when Etienne Geoffroy Saint-Hilaire (1825) advanced his hypothesis that the originating event of evolutionary change was an anomaly of embryonic or fetal development. The origin or initiation of evolutionary change was thus seen as a change in the very early development of an atypical individual. Although not a believer in evolution (in the sense that a species could become so modified as to give rise to a new species), Karl Ernst von Baer (1828) used the description of individual development as a basis for classifying the relationships among species: Those that shared the most developmental features were classified together, while those that shared the fewest features were given a remote classification. Von Baer noticed that vertebrate species are much more alike in their early developmental stages than in their later stages. This was such a ubiquitous observation that von Baer formulated a law to the effect that development in various vertebrate species could be universally characterized as progressing from the homogeneous to the heterogeneous or from the general to the specific. As individuals in each species reached the later stages of their development, they began to differentiate more and more away from each other, so there was less and less resemblance as each species reached adulthood. Figure 5.1 is a reproduction of von Baer's classification of various classes of vertebrate species, based on his developmental observations.

The Birth of Experimental Embryology

Von Baer's emphasis on the importance of developmental description represented a great leap forward in understanding the question of "What?" but it did not come to grips with the problem of "How." He and his predecessors evinced no interest in the mechanisms or means by which each developmental stage is brought about—it simply was not a question for them. It remained for the self-designated experimental embryologists of the late 1800s to ask that developmental question: Wilhelm His, Wilhelm Roux, and Hans Driesch. His (1888) wrote, in reference to von Baer's observations:

> By comparison of [the developmental of] different organisms, and by finding their similarities, we throw light upon their probable genealogical relations, but we give no direct explanation of their growth and formation. A direct explanation can only come from the immediate study of the different phases of individual development. Every stage of development must be looked at as the physiological consequence of some preceding stage, and ultimately as the consequence of the acts of impregnation and segmentation of the egg. (p. 295)

It remained for Roux, in 1888/1974, to plunge a hot needle into one of the two existing cells after the first cleavage in a frog's egg, thereby initiating a truly *experimental* study of embryology.

The arduously reached conclusion—the one we hold today—that individual development is most appropriately viewed as a hierarchically organized system began with Hans Driesch being dumbfounded by the results of his replication of Roux's experiment. While Roux found that killing one cell and allowing the second cleavage cell to survive resulted in a half-embryo in frogs, Driesch (reviewed in 1908/1929) found that disattaching the

[1] This first section heading introduces "A" systems view, not "The" systems view. For a partial illustration of the variety of developmental systems views in the behavioral sciences, interested readers are referred to Ford and Lerner's (1992) description of their version of a systems view of human development and, at even more abstract level, Oyama's (1985) depiction of her ideas about developmental systems and evolution. Figure 5.6 gives the essence of Gottlieb's notion of a developmental psychobiological systems approach as it has been worked out, beginning with the central concepts of bidirectionality and probabilistic epigenesis in 1970.

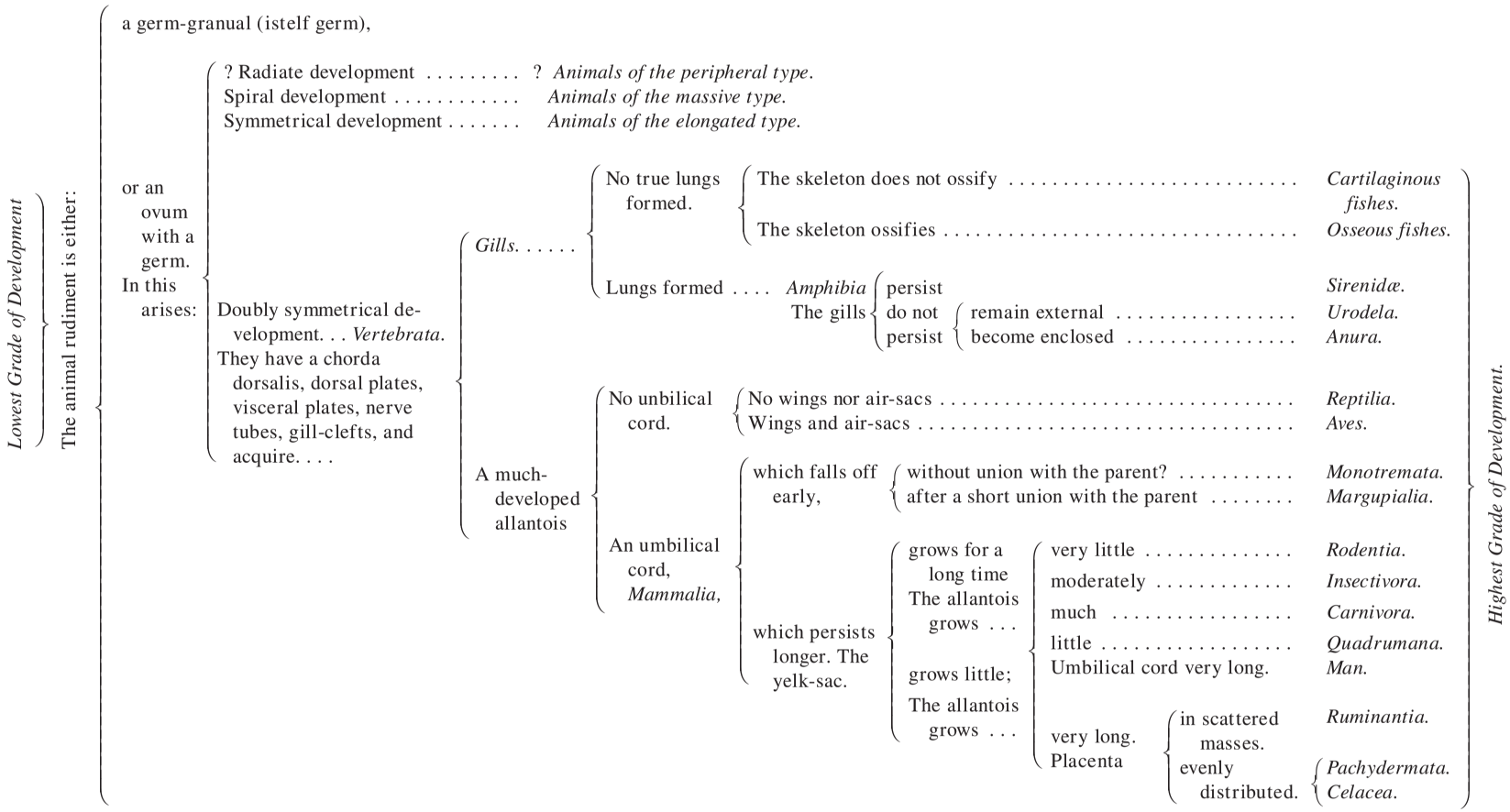

Lowest Grade of Development
The animal rudiment is either:
a germ-granual (istelf germ),
or an ovum with a germ. In this arises:
? Radiate development . . . . . ? Animals of the peripheral type.
Spiral development . . . . . Animals of the massive type.
Symmetrical development . . . . . Animals of the elongated type.
Doubly symmetrical development. . . Vertebrata.
They have a chorda dorsalis, dorsal plates, visceral plates, nerve tubes, gill-clefts, and acquire. . . .
Gills. . . . .
No true lungs formed.
The skeleton does not ossify . . . . . Cartilaginous fishes.
The skeleton ossifies . . . . . Osseous fishes.
Lungs formed . . . . Amphibia
The gills persist Sirenidæ.
do not persist
remain external . . . . . Urodela.
become enclosed . . . . . Anura.
A much-developed allantois
No unbilical cord.
No wings nor air-sacs . . . . . Reptilia.
Wings and air-sacs . . . . . Aves.
An umbilical cord, Mammalia,
which falls off early,
without union with the parent? . . . . . Monotremata.
after a short union with the parent . . . . . Margupialia.
which persists longer. The yelk-sac.
The allantois grows . . .
grows for a long time
grows little;
The allantois grows . . .
very little . . . . . Rodentia.
moderately . . . . . Insectivora.
much . . . . . Carnivora.
little . . . . . Quadrumana.
Umbilical cord very long. Man.
very long. Placenta
in scattered masses. Ruminantia.
evenly distributed.
Pachydermata.
Celacea.
Highest Grade of Development.

Figure 5.1 Von Baer's scheme of the progress of development. Von Baer's developmental classification of various classes of vertebrate animals (fish, amphibians, reptiles, birds, and mammals [Monotremata through Cetacea]) appears along the right vertical axis. His three other "types" of bodily organization are briefly designated in the upper left portion of the figure. Von Baer's scheme is not evolutionary in the conventional sense of ancestors giving rise to descendants. Rather, he sees an increasing complexity of prenatal structural organization going from the top to the bottom of the figure. For von Baer, the most complex prenatal organizations reflect the highest grade of ontogenetic development. Grades of development proceed from lowest (beginning on the left side of the figure) to highest (right side of the figure), whereas structural organizational complexity goes from the lowest (top) to the highest (bottom) on the right vertical axis. *Source:* From *Über Entwickelungsgeschichte der Thiere: Pt. 1. Beobachtung und Reflexion,* by K. E. von Baer, 1828, Konigsberg, Germany: Borntrager; and *Scientific Memoirs, Selected from the Transactions of Foreign Academies of Science, and from Foreign Journals: Natural History,* by A. Henfry and T. H. Huxley, 1853, London: Taylor & Francis.

first two cells in a sea urchin resulted in two fully formed sea urchins, albeit diminished in size. [When the disarticulation procedure was later used in amphibians, two fully formed embryos resulted as in Driesch's experiment with sea urchins (Mangold & Seidel, 1927).] Driesch came to believe that some nonmaterial vitalistic influence (an "entelechy") was at work in the formation of the embryo, one that will forever elude our best experimental efforts, so, he eventually gave up embryology in favor of the presumably more manageable problems of psychology.

Because Driesch had found that a single cell could lead to the creation of a fully formed individual, he gathered, quite correctly, that each cell must have the same prospective potency, as he called it, and could, in principle, become any part of the body. He thought of these cells as *harmonious-equipotential systems.* For Driesch, the vitalistic features of these harmonious-equipotential systems is their ability to reach the same outcome or endpoint by different routes, a process which he labeled equifinality. Thus, in the usual case, two attached cleavage cells give rise to an embryo; and in the unusual case of two separated cleavage cells, each gives rise to an embryo. To Driesch, these experimental observations provided the most elementary or "easy" proofs of vitalism; for those still laboring in the field of embryology today, they continue to provide a provocative challenge for experimental resolution and discovery.

For the present purposes, it is important to note that, if each cell of the organism is a harmonious-equipotential system, then it follows that the organism itself must be such a system. Driesch's concept of *equifinality*—that developing organisms of the same species can reach the same endpoint via different developmental pathways—has become an axiom of developmental systems theory.[2] In a systems view of developmental psychology, equifinality means that (a) developing organisms that have different early or "initial" conditions can reach the same endpoint, and (b) organisms that share the same initial condition can reach the same endpoint by different routes or pathways (cf. Ford & Lerner, 1992). Both of these outcomes have been empirically demonstrated by the behavioral research of D. B. Miller (Miller, Hicinbothom, & Blaich, 1990) and R. Lickliter (Banker & Lickliter, 1993) in birds, and by Noel (1989) and Carlier, Roubertoux, Kottler, and Degrelle (1989), among others, in mammals. The uniquely important developmental principle of equifinality is rarely explicitly invoked in theoretical views of developmental psychology, so it may seem unfamiliar to many readers. K. W. Fischer's (1980) theory of skill development in infancy and early childhood is one of the rare exceptions in that it explicitly incorporates the notion of equifinality: "[D]ifferent individuals will follow different developmental paths in the same skill domain. . . . The developmental transformation rules predict a large number of different possible paths in any single domain" (p. 513).

Microgenetic studies of human development are most likely to reveal equifinality because, under these conditions, the response of individuals to the same challenges is closely monitored and described for shorter or longer periods (e.g., Kuhn, 1995). In one study, Bellugi, Wang, and Jernigan (1994) monitored the attempted solutions of Williams syndrome and Down syndrome children, aged 10 to 18 years, to the block design subtest on the Wechsler Intelligence Scale for Children-Revised (WISC-R). The children in both groups performed equally poorly, but the attempted solutions by the Down syndrome individuals approximated in a global way the designs they were trying to copy, whereas the Williams group uniquely failed to reproduce the correct global configuration of the blocks. As shown in Figure 5.2, the children in both groups got the same low scores, but they achieved them in very different ways (by different pathways).

Another example involved a study of language development in young hearing and deaf preschool children. Each group devised an arbitrary system of signs to refer to events and objects, but the hearing children achieved the outcome by using the language of their adult caretakers as their model, whereas the deaf preschool children, being born to hearing parents who did not know sign language, developed their own arbitrary set of gestures to communicate meaningfully with peers and adults (Goldin-Meadow, 1997).

As a final example, in lines of mice selectively bred for high and low aggression, individuals in the low line become as aggressive as the high line if they are tested four times from day 28 to 235 of life (Figure 5.3; Cairns, MacCombie, & Hood, 1983). Once again, the developmental pathways to the same endpoint are different.

[2] Egon Brunswik, in his infrequently cited monograph for the *International Encyclopedia of Unified Science,* "The Conceptual Framework of Psychology" (1952), was the first to call attention to equifinality as an important principle of psychological development.

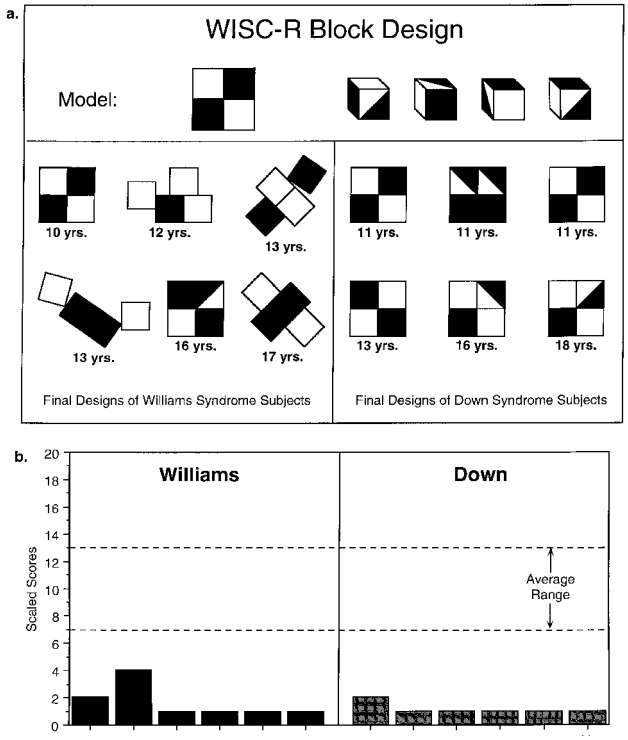


Figure 5.2 Contrasting block design performance in Williams syndrome (WS) and Down syndrome (DS) children. (1) Both WS and DS designs reveal striking differences in their errors. WS subjects uniquely fail to reproduce the correct global configuration of the blocks. (2) The differences in the errors are not reflected in quantitative scores, which are comparably low. *Source:* From "Williams Syndrome: An Unusual Neuropsychological Profile" (pp. 23–56), by U. Bellugi, P. P. Wang, and T. L. Jernigan, in *Atypical Cognitive Deficits in Developmental Disorders: Implications for Brain Functions,* S. H. Broman and J. Grafman (Eds.), 1994, Hillsdale, NJ: Erlbaum. Copyright 1994 by Dr. U. Bellugi, the Salk Institute, La Jolla, California. Reprinted with permission.

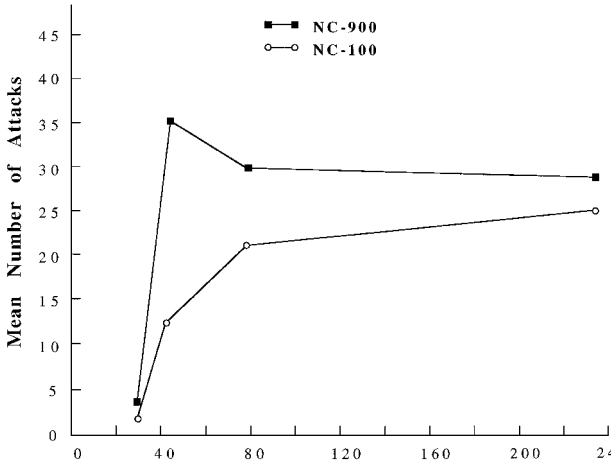


Figure 5.3 Mean number of 5-sec blocks in which subjects of high-aggressive (NC-900) and low-aggressive (NC-100) lines attacked their test partners. (The same subjects were repeatedly tested at days 28, 42, 72, and 235.) *Source:* From "A Developmental-Genetic Analysis of Aggressive Behavior in Mice: I. Behavioral Outcomes," by R. B. Cairns, D. J. MacCombie, and K. E. Hood, 1983, *Journal of Comparative Psychology, 97,* pp. 69–89.

However, in these mouse experiments, equifinality does not mean there is a genetic pathway in the high line and an experiential pathway in the low line—the expression of aggression is genetically and experientially mediated in both lines. The crucial experience in the developmental pathway to high aggression in the high line is rearing in social isolation between days 21 and 45, whereas the crucial experience in the developmental pathway to high aggression in the low line is repeated testing from days 45 to 235. This latter finding raises a highly significant question: Would the usual line difference in aggression at day 45 be erased if the low line were repeatedly tested before day 45 rather than after day 45?

Systems versus Mechanico-Reductive and Vitalistic-Constructive Viewpoints

As our overview of the precursors to our present concept of the systems nature of development moves from the late 1800s to the 1930s, we encounter the insights of the systems or organismic embryologists, Paul Weiss and Ludwig von Bertalanffy, and the physiological geneticist Sewall Wright.

In his wonderfully lucid and historically complete opus on the topic of development, *Modern Theories of Development: An Introduction to Theoretical Biology* (originally published in German), von Bertalanffy (1933/1962) introduced the system theory, as he called it, as a way of avoiding the pitfalls of machine theory, on the one hand, and vitalism, on the other. The error of the "machine theory" of development, as von Bertalanffy saw it, was its attempt to analyze the various aspects of the development process in terms of their individual component parts or mechanisms, conceived of as proceeding independently of one another. Von Bertalanffy believed that the fundamental error of the classical concept of mechanism, which was adopted wholesale from physics, lay in its application of an additive point of view to the interpretation of living organisms. In comparison:

> Vitalism, on the other hand, while being at one with the machine theory in analyzing the vital processes into oc-

currences running along their separate lines, believed these to be coordinated by an immaterial, transcendent entelechy. Neither of these views is justified by the facts. We believe now that the solution of this antithesis in biology is to be sought in an organismic or system theory of the organism which, on the one hand, in opposition to machine theory, sees the essence of the organism in the harmony and co-ordination of the processes among one another, but, on the other hand, does not interpret this co-ordination as vitalism does, by means of a mystical entelechy, but through the forces immanent in the living system itself. (von Bertalanffy, 1933/1962, pp. 177–178)

Nowadays, we make von Bertalanffy's point by distinguishing between theoretical and methodological reductionism. Theoretical reductionism seeks to explain the behavior of the whole organism by reference to its component parts—a derivative of the older additive, physical concept of mechanism. Methodological reductionism holds that not only is a description of the various hierarchically organized levels of analysis of the whole organism necessary, but a depiction of the bidirectional traffic between levels is crucial to a developmental understanding of the individual.[3] For purposes of recognizing historical precedent, it is appropriate here to present the diagrams of Paul Weiss and Sewall Wright, which exemplify the strictly methodological reductionism of the hierarchically organized systems view of development. (We use what we hope is not an annoying plural form of system because the various levels of organismic functioning constitute, within themselves, systems of analysis: the organism-environment ecological system, the nervous system, the genomic system, and others. Von Bertalanffy himself later, 1950, came to use the plural form in his conception of "General Systems Theory.")

In Paul Weiss's (1959) scheme of the hierarchy of reciprocal influences (Figure 5.4), there are seven levels of analysis. The *gene* (DNA) is the ultimately reduced unit in an ever-expanding analytic pathway that moves from gene to *chromosome*—where genes can influence each other—from cell *nucleus* to cell *cytoplasm,* from cell to *tissue* (organized arrangements of cells that form organ systems such as the nervous system, circulatory system, musculoskeletal system, etc.), all of which make up the *organism* that interacts with the external *environment.* The entire schema represents a hierarchically organized system of increasing size, differentiation, and complexity in which each component affects, and is affected by, all the other components not only at its own level but at lower and higher levels as well. Thus, the arrows of influence in Figure 5.4 not only go upward from

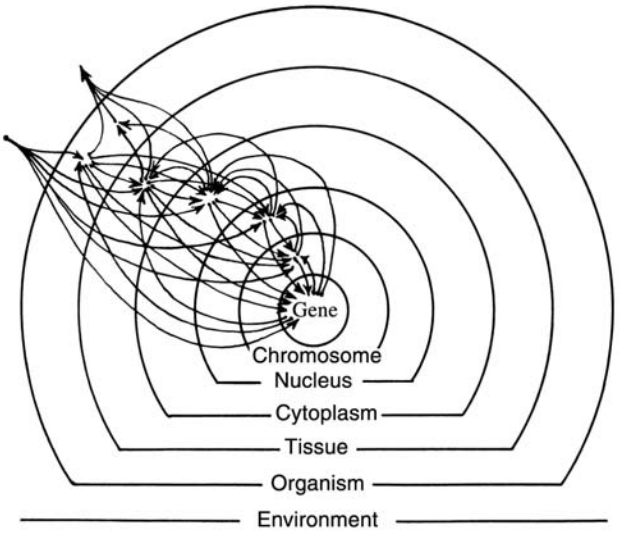


Figure 5.4 Embryologist Paul Weiss's hierarchy of reciprocal influences from the lowest level of organization (gene) to the highest level (external environment). *Source:* From "Cellular Dynamics," by P. Weiss, 1959, *Reviews of Modern Physics, 31,* pp. 11–20. Copyright 1959 by Reviews of Modern Physics. Reprinted with permission.

[3] Systems thinking is catching on in neuroscience. As a tribute to his long and productive career in neuroembryology, the *International Journal of Developmental Neuroscience* publishes an Annual Viktor Hamburger Award Review. In 1993, the award went to Ira B. Black, who published a review on "Environmental Regulation of Brain Trophic Interactions," which detailed the influence of neural activity on multiple trophic (growth) factors during development, further attesting to the feasibility of working out the bidirectional relations depicted in Figure 5.6. Black himself raised that optimistic question at the conclusion of his review: "Are we now in a position to move from environmental stimulus to impulse activity, trophic regulation, mental function and behavior . . . ?" (p. 409). A later Viktor Hamburger Award Review continued that theme with Carla Shatz's (1994) "Role for Spontaneous Neural Activity in the Patterning of Connections between Retina and LGN during Visual Systems Development," which is also in keeping with the first author's broad definition of the term *experience* ("spontaneous or evoked functional activity") in this chapter and earlier (Gottlieb, 1976). Even when an organism's experience arises out of an interaction with the external environment, there is an essential internal (cellular) correlate to that activity, so that is the rationale for including endogenous activity as part of the experiential process. Perhaps, for some readers, it would be more appropriate to drop the term *experience* and use the term *functional activity* at both the neural and behavioral levels of analysis. To the first author's way of thinking, experience and functional activity are synonymous.

the gene, eventually reaching all the way to the external environment through the activities of the whole organism, but the arrows of influence also return from the external environment through the various levels of the organism back to the genes.

While the feed-forward or feed-upward nature of the genes has always been appreciated, the feed-backward or feed-downward influences have usually been thought to stop at the cell membrane. The newer conception is one of a totally interrelated, fully coactional system in which the activity of the genes themselves can be affected through the cytoplasm of the cell by events originating at any other level in the system, including the external environment. For example, external environmental factors such as social interactions, changing day length, and so on, can cause hormones to be secreted (review by Cheng, 1979), and these hormones result in the activation of DNA transcription inside the nucleus of the cell (i.e., "turning genes on"). There are now many empirical examples of external sensory and internal neural events that excite and inhibit gene expression (e.g., Anokhin, Milevsnic, Shamakina, & Rose, 1991; Calamandrei & Keverne, 1994; Mauro, Wood, Krushel, Crossin, & Edelman, 1994; Rustak, Robertson, Wisden, & Hunt, 1990), thereby supporting the *bidirectionality* of influences among the various levels of analysis from gene to environment (to be discussed later).

Weiss was an experimental embryologist, so it was probably merely an oversight that he did not explicitly include a developmental dimension in his figure. Another schematic of a system view, also not explicitly developmental, was put forward by Sewall Wright in 1968. In Wright's schema (Figure 5.5), once again, the traffic between levels is bidirectional and the activity of the

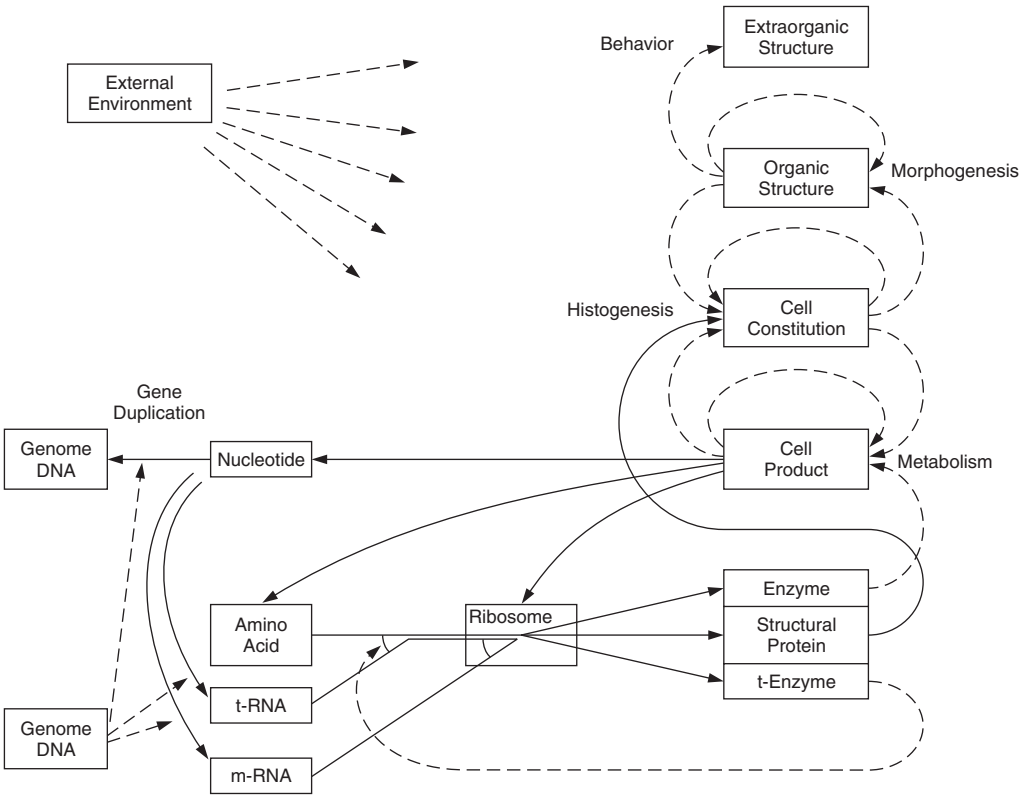


Figure 5.5 The fully coactive or interactional organismic system, as presented by Sewall Wright, a physiologically oriented population geneticist. *Source:* From *Evolution and the Genetics of Populations: Vol. 1. Genetic and Biometric Foundations,* by S. Wright, 1968, Chicago: University of Chicago Press.

genes is placed firmly inside a completely coactional system of influences. It is a small but important step to apply this way of thinking to the process of development (see Figure 5.6).

Influences of Sensory Stimulation on Genetic Activity

Some behavioral scientists, including developmental psychologists, seem to be unaware of the fact that the genes (DNA) themselves are subject to influences from higher levels during the course of development. Therefore, it is useful to stress that contingency as a part of the *normal* process of development. For example, one category of genetic activity called *immediate early gene expression* is specifically responsive to sensory stimulation. A higher number of neurons is found in the brains of animals that have been appropriately stimulated, and a deficiency in the number of cortical neurons in animals that have been deprived of such normal sensory stimulation (e.g., Rosen, McCormack, Villa-Komaroff, & Mower, 1992, and references therein). Not so long ago, neuroscientists of very high repute, including at least one eventual Nobel Prize winner, were writing in a vein that would seem to make sensory-stimulated immediate early gene expression an impossibility rather than an important feature of normal neurobehavioral development. For example, Roger Sperry (1951) wrote, "[T]he bulk of the nervous system must be patterned without the aid of functional adjustment" or "Development in many instances . . . is remarkably independent of function, even in . . . [the] sense . . . [of] . . . function as a general condition necessary to healthy growth" (p. 271). Twenty years later, Sperry (1971) continued to observe: "In general outline at least, one could now see how it could be entirely possible for behavioral nerve circuits of extreme intricacy and precision to be inherited and organized prefunctionally solely by the mechanisms of embryonic growth and differentiation" (p. 32). Sperry was not alone in expressing a genetically predeterministic conception of neural and behavioral epigenesis. Viktor Hamburger, perhaps the foremost student of Nobel laureate Hans Spemann, echoed Sperry's beliefs on several occasions that, to his credit, he later ameliorated:

> The architecture of the nervous system, and the concomitant behavior patterns result from self-generating growth and maturation processes that are determined entirely by inherited, intrinsic factors, to the exclusion of functional adjustment, exercise, or anything else akin to leaning. (Hamburger, 1957, p. 56; reiterated in toto in 1964, p. 21)

With noted authorities on the development of the nervous system making such statements in books and articles apt to be read by biologically oriented psychologists, it is not surprising that a genetically predeterministic view entered into psychology, especially when psychology was trying to recover its balance from accusations of the other error—environmentalism. One of the values of a systems view of development is the explicit utilization of both genetic and experiential influences, not merely a nervous (and often empty) lip service averring that both are surely necessary.

The Developmental Manifold Concept

Development is composed of a system of influences, both intraorganismic and extraorganismic. Even behavior that appears to be innate or instinctive has as its prenatal and postnatal background this system of influences, ranging from genes, the cytoplasm of the cell, protein-protein relations, cell-cell interactions, sensory stimulation, motor activity, and so on. These influences are part of the normal, species-typical internal and external environments, and I (G. Gottlieb) have called them the "developmental manifold" to call attention to the various constituents that give rise to any and all behavioral phenotypes (outcomes of development). In fact, I have followed T. C. Schneirla (1956) in calling all these influences *experiences.* Obvious forms of experience that we label learning are a subset in this much broadened definition. (See the section: Experience Defined as Functional Activity.)

I was led to the developmental manifold concept by my own research investigations into the role of prenatal factors in the development of instinctive behavior in ducklings (Gottlieb, 1971a). In 1965, I had shown that ducklings and chicks hatched in incubators, and thus deprived of maternal contact, could nonetheless identify the maternal assembly call of their own species after hatching. The only vocal-auditory experience they had was exposure to their own and sibling vocalizations prior to entering the test situation. In 1966, I showed that enhancing exposure to sibling vocalizations lowered the latency and increased the duration of their behavioral response to their own species maternal call. However, it was necessary to devise an embryonic devocalization procedure to

truly rule in the critical importance of the embryonic vocalizations in perfecting the perceptual selectivity of the response that was evident after hatching. With the help of John Vandenbergh, I was able to devise an embryonic muting operation that did not otherwise interfere with the health of the embryo and hatchling (Gottlieb & Vandenbergh, 1968). Now, the selectivity of the postnatal response to the species' maternal call could be examined in ducklings that had not experienced their own or sibling vocalizations. And the result showed the devocalized mallard duckling's usual auditory selectivity was not in place: They could not distinguish the mallard maternal call from the chicken maternal call. The control birds that had been allowed to hear their own embryonic vocalizations for 18 to 23 hours before being devocalized did show the usual preference for the mallard maternal call over the chicken maternal call (Gottlieb, 1971a, pp. 141–142). This experiential influence is not attributable to any conventional or obvious form of learning because the embryonic and maternal calls have different primary acoustic features and do not sound at all alike to the human ear.

The outcome of these experiments led to the formulation of the developmental manifold concept:

> The present results indicate that the epigenesis of species-specific auditory perception is a probabilistic phenomenon, the threshold, timing, and ultimate perfection of such perception being regulated jointly by organismic and sensory stimulative factors. In the normal course of development, the manifest changes and improvements in species-specific perception do not represent merely the unfolding of a fixed or predetermined organic substrate independent of normally occurring sensory stimulation. With respect to the evolution of species-specific perception, natural selection would seem to have involved a selection for the entire developmental manifold, including both the organic and normally occurring stimulative features of ontogeny. (Gottlieb, 1971a)

In 1987, West and King took the developmental manifold idea a step further by pointing out that: In addition to our genes, we not only inherit a fairly standard embryonic and fetal stimulative environment but also parents, peers, and the places they inhabit. They coined the term *ontogenetic niche* to signify the species-typical ecological and social legacies that accompany genes. Thus, we not only inherit nature (genes) but also nurture (the usual prenatal and early postnatal environmental conditions that prevail in any given species).

Developmental Causality (Coaction)

Behavioral (or organic or neural) outcomes of development are a consequence of at least two specific components of coaction (e.g., person-person, organism-organism, organism-environment, cell-cell, nucleus-cytoplasm, sensory stimulation-sensory system, activity-motor behavior). The cause of development—what makes development happen—is the relationship of the two components, not the components themselves. Genes in themselves cannot cause development any more than stimulation in itself can cause development. When we speak of coaction as being at the heart of the developmental analysis of causality, what we mean is that we need to specify some relationship between at least two components of the developmental system. The concept used most frequently to designate coactions at the organismic level of functioning is *experience*. Experience is thus a relational term.

Because developing systems are by definition always changing in some way, statements of developmental causality must also include a temporal dimension describing when the experience or organic coactions occurred. For example, one of the earliest findings of experimental embryology had to do with the differences in outcome according to the time during early development when tissue was transplanted. When tissue from the head region of the embryo was transplanted to the embryo's back, if the transplantation occurred early in development, the tissue differentiated according to its new surround (i.e., it differentiated into back tissue), whereas if the transplant occurred later in development, the tissue differentiated according to its previous surround so that, for example, a third eye might appear on the back of the embryo. These transplantation experiments demonstrated not only the importance of time but also the essentially coactional nature of embryonic development.

Significance of Coaction for Individual Development

The early formulation by Weismann (1894) of the role of the hereditary material (what came to be called *genes*) in individual development held that different parts of the genome or genic system caused the differentiation of the different parts of the developing organism, so that there were thought to be genes for eyes, genes for legs, genes for toes, and so forth. Driesch's experiment (1908/1929),

in which he separated the first two cells of a sea urchin's development and obtained a fully formed sea urchin from each of the cells, showed that each cell contained a complete complement of genes. This means that each cell is capable of developing into any part of the body, a competency that was called *equipotentiality* or *pluripotency* in the jargon of the early history of experimental embryology and is called *totipotency* and *multipotentiality* in today's terms (e.g., DiBerardino, 1988). Each cell does not develop into just any part of the body, even though it has the capability of doing so. Each cell develops in accordance with its surround so that cells at the anterior pole of the embryo develop into parts of the head, cells at the posterior pole develop into parts of the tail end of the body, cells in the foremost lateral region of the embryo develop into forelimbs, those in the hindmost lateral region develop into hind limbs, the dorsal area of the embryo develops into the back, and so on.

Although we do not know what actually causes cells to differentiate appropriately according to their surround, we do know that it is the cell's interaction with its surround, including other cells in that same area, that causes the cell to differentiate appropriately. The actual role of genes (DNA) is not to produce an arm, a leg, or fingers, but to produce protein (through the coactions inherent in the formula DNA ↔ RNA ↔ protein). The specific proteins produced by the DNA-RNA-cytoplasm coaction are influenced by coactions above the level of DNA-RNA coaction.

In sum, when certain scientists refer to behavior or any other aspect of organismic structure or function as being "genetically determined," they are not mindful of the fact that genes synthesize protein in the context of a developmental system of higher influences. Thus, for example, as experiments on the early development of the nervous system have demonstrated, the amount of protein synthesis is regulated by neural activity, once again demonstrating the bidirectionality and coaction of influences during individual development (e.g., Born & Rubel, 1988; summaries in Changeux & Konishi, 1987).

The Triumph of Probabilistic Epigenesis over Predetermined Epigenesis

In 1970, Gottlieb described an extant dichotomy in conceptualizing individual development as the predetermined and probabilistic epigenesis of behavior. *Predetermined epigenesis* saw a genetically inspired structural maturation as bringing about function in an essentially unidirectional fashion, whereas *probabilistic epigenesis* envisaged bidirectional influences between structure and function. The range of application of the probabilistic conception did not seem very broad at the time. In 1976, Gottlieb explicitly added the genetic level to the scheme so that the unidirectional predetermined conception was pictured as

$$\text{Genetic activity} \rightarrow \text{Structure} \rightarrow \text{Function}$$

in a nonreciprocal pathway, whereas the probabilistic notion was fully bidirectional:

$$\text{Genetic activity} \leftrightarrow \text{Structure} \leftrightarrow \text{Function.}$$

Now that spontaneous neural activity as well as behavioral and environmental stimulation are accepted as playing roles in normal neural development, and that sensory and hormonal influences can trigger genetic activity, the correctness and broad applicability of the probabilistic notion are undeniable and widely confirmed. In this sense, the probabilistic conception of epigenesis has triumphed over the predetermined view.

Building on the probabilistic notion, Gottlieb (1991, 1992) has more recently presented a simplified scheme of a systems view of psychobiological development that incorporates the major points of von Bertalanffy, Weiss, and Wright on the subject, and adds some detail on the organism-environment level that seems useful for a thoroughgoing behavioral and psychobiological analysis. Any merit this way of thinking about development may have must be traced to the pioneering efforts of psychobiological theoreticians such as Z.-Y. Kuo (summarized in 1976), T. C. Schneirla (1960), and D. S. Lehrman (1970). At present, the probabilistic, bidirectional conception is being used both implicitly and explicitly by a number of more recent psychobiologically oriented theorists (e.g., Cairns, Gariépy, & Hood, 1990; Edelman, 1988; Ford & Lerner, 1992; Griffiths & Gray, 1994; Hinde, 1990; Johnston & Edwards, 2002; Magnusson & Törestad, 1993; Oyama, 1985).

As shown in Figure 5.6, Gottlieb has reduced the levels of analysis to three functional organismic levels (genetic, neural, behavioral) and has subdivided the environmental level into physical, social, and cultural

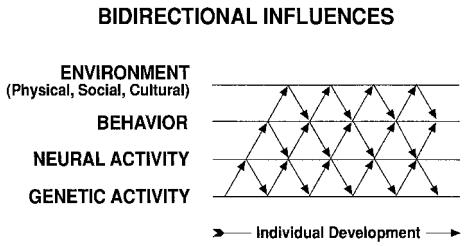


Figure 5.6 A systems view of psychobiological development. *Source:* From *Individual Development and Evolution: The Genesis of Novel Behavior,* by Gilbert Gottlieb, 1992, New York: Oxford University Press. Copyright 2002 by Gilbert Gottlieb.

components.[4] Those who work with nonhuman animal models stress the influence of the physical and social aspects of the environment; those who work with humans prominently include cultural aspects as well. The criticism that one hears most about this admittedly simple-minded scheme is not that it is overly simple but that it is too complex: There are too many influences, running in too many directions. In short, a developmental psychobiological systems approach is alleged to be unmanageable and just not useful for analytic purposes. What we hope to show in the remainder of this chapter is that such a scheme is not only useful but represents individual development at a suitable level of complexity that does justice to the actualities of developmental influences.[5]

Experience Defined as Functional Activity

Before turning to a review of developmental behavior genetics and intersensory influences in an effort to link all four levels of analysis in Figure 5.6, it is necessary to offer a definition of the term *experience* that will allow us to discuss experiential events occurring at each level of analysis, not just at the organism-environment level. Experience is synonymous with function or activity, and is construed very broadly to include the electrical activity of nerve cells and their processes: impulse conduction; neurochemical and hormonal secretion; the use and exercise of muscles and sense organs (whether interoceptive, proprioceptive, or exteroceptive); and, of course, the behavior of the organism itself. Thus, the term *experience,* as used here, is not synonymous with *environment,* but rather stresses functional *activity* at the neural and behavioral levels of analysis. The contribution of such functions to development can take any three forms: (1) *inductive,* channeling development in one direction rather than another; (2) *facilitative* (temporal or quantitative), influencing thresholds or the rate at which structural and physiological maturation, or behavioral development occurs; or (3) *maintenance,* serving to sustain the integrity of already induced neural or behavioral systems. The various courses these three experiential influences can take during development are show in Figure 5.7.

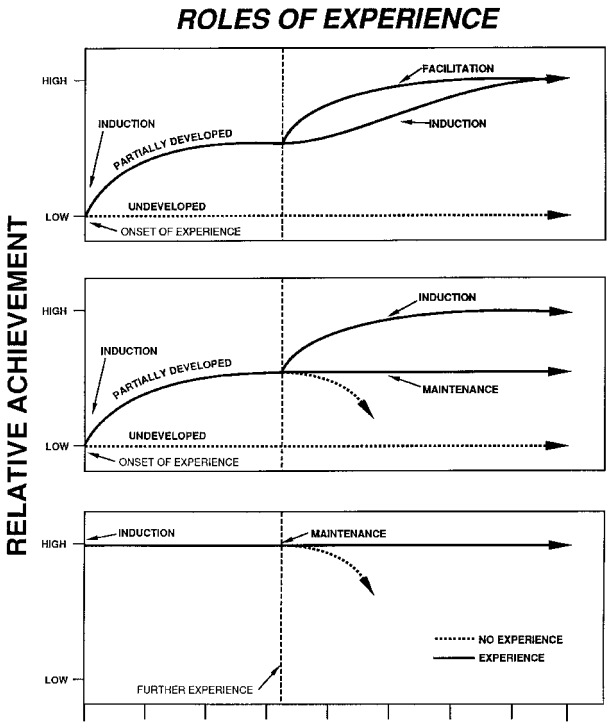


Figure 5.7 The various roles of experience (functional activity) during the course of development at the neural and behavioral levels of analysis. *Source:* From *Individual Development and Evolution: The Genesis of Novel Behavior,* by Gilbert Gottlieb, 1992, New York: Oxford University Press. Copyright 2002 by Gilbert Gottlieb.

[4] Gariépy (1995) has correctly pointed out that psychological functioning as such is not included in the four levels of Gottlieb's systems diagram (Figure 5.6). The reason for that omission is that psychological functioning or mediation (perception, thinking, attitudes, love, hate, etc.) must be inferred from analysis at the overt level of behavior and the environment, as made clear by the notion of methodological behaviorism introduced by E. C. Tolman in 1932. In this sense, all psychologists are methodological (not theoretical) behaviorists (cf. Brunswik, 1952).

[5] At the conclusion of their review of genotype and maternal environment, Roubertoux, Nosten-Bertrand, and Carlier (1990) observe: "The effects constitute a very complex network, which is probably discouraging for those who still hope to establish a simple relation between the different levels of biological organization, and particularly the molecular and the behavioral. The picture is indeed more complicated" (p. 239).

Summary of the Features of a Developmental Psychobiological Systems View

In its finished form, the developmental psychobiological systems approach involves a temporal description of activity at the genetic, neural, behavioral, and environmental levels of analysis, and the bidirectional effects of such activity among the four levels. When the related notions of bidirectionality and probabilistic epigenesis were first put forth (Gottlieb, 1970), they were largely intuitive. They seem now to be established facts in many, if not all, quarters. Given the experimental-embryological heritage of all systems views, two further assumptions or propositions are warranted:

1. Because of the early equipotentiality of cells and the fact that only a small part of the genome is expressed in any individual (Gottlieb, 1992), what is actually realized during the course of individual psychological and behavioral development represents only a fraction of many other possibilities (also see Kuo, 1976, on this point).
2. A developmental systems view entails the notion of equifinality; that is, the possibility of variation in pathways to common developmental endpoints. (A more detailed review of the early history and current status of this systems view can be found in Gottlieb, 1997.)

DEVELOPMENTAL BEHAVIOR GENETICS

In the next two sections of this chapter, this developmental psychobiological systems view is further elaborated with reference to developmental behavior genetics and intersensory influences on neural and psychobiological functioning in the prenatal and postnatal period.

Approaches to the Genetic Analysis of Development

Research on development usually addresses one of two broad questions and employs methods appropriate to each. This has often led to misunderstanding, especially in the realm of developmental behavior genetics, when results from one methodology have been invoked to answer a question that requires a different methodology.

Two Questions about Development

The first question concerns the causes of the average or typical course of development from the fertilized ovum to the elaborated adult. It occupied the earliest embryologists and remains one of the foremost intellectual challenges of modern science. Large differences between species are often examined in this context. Many of the most important advances in understanding average or species-typical development have utilized the experimental method to modify the course of individual development via surgical operations, altered sensory experience, or chemical treatments (Jacobson, 1991; Purves, 1994).

This approach (development of the individual) is exemplified in studies of the origin of the nervous system, using tracer molecules such as horseradish peroxidase (HRP). When injected into one cell of a 16-cell frog embryo, the HRP is then transmitted to all cells that are derived from that one by mitosis, and staining the differentiated embryo for HRP several days later reveals the developmental fate of the one cell (Moody, 1987). Although one cell may give rise to a particular kind of neuron in the central nervous system under normal circumstances, when that specific cell is destroyed in the 16-cell embryo, the fate of an adjacent cell is then altered to produce the required neuron (Jacobson, 1981), and an apparently normal organism emerges from a deliberately abnormal embryo. This kind of experiment reveals the crucial role of interactions between cells for the differentiation of the embryo into a system of organs. It manipulates neither the heredity nor the environment of the embryo; instead, it explores the internal processes of individual development.

The second question (the population approach) asks about the origins of individual differences in phenotypes among adults of the same species. Historically, this has been the focus of psychologists concerned with testing human mental abilities (Francis Galton, Cyril Burt) as well as geneticists interested in crop yields and evolution (Ronald Fisher, Sewall Wright). What sometimes passes for developmental behavior genetic research on human children typically employs correlational methods of statistical analysis and proceeds in virtual isolation from experimental neuroembryology (see critique by Gottlieb, 1995).

In its earliest stages, the science of genetics was nondevelopmental. At the same time, embryology

progressed along a separate course, with little concern for genetics (Allen, 1985; Sarkar, 1999). Mendel believed that his "constant differentiating characters" of garden peas were themselves inherited. His was a mosaic theory of heredity wherein each characteristic of the individual (height, color, or shape) was determined by a separate unit of heredity. This concept was adopted by those who rediscovered Mendel's laws and by Bateson (1913), who termed the units *genes.* From the outset of genetics in the twentieth century, a gene was named for its most salient phenotypic effect (e.g., *white eye* in fruit flies, *diabetes* and *waltzer* in mice), implying that a gene codes for the specific phenotype and the mutant reveals a gene's true function.

Pursuit of answers to the two major questions need not involve minds inhabiting two solitudes. Darwin integrated knowledge of embryology and individual variation in a masterful way to bolster his conclusions about evolution, and more recent theorists have also highlighted the importance of organismic development for natural selection and evolution (Gould, 1977; McKinney & McNamara, 1991; Salthe, 1993). Indeed, developmental systems theory offers unique insights into the relations among embryogenesis, individual differences, and evolution (Gottlieb, 1992; Johnston & Gottlieb, 1990).

Generally speaking, a theory that emphasizes the bidirectional nature of interaction between hierarchical levels of a living system (Figure 5.6) also encourages synergistic relations between allied scientific disciplines. A good example of this disciplinary synergism is evident in the multilevel analysis of gene-environment interaction by Johnston and Edwards (2002), reproduced in Figure 5.8. In contrast, the strongly reductionist approach of quantitative behavior genetics has devoted little attention to the levels between gene and behavior, thereby isolating psychology from comparative embryology, developmental genetics, and neuroscience.

The study of individual differences cannot provide a comprehensive account of organismic development. Many of the genes we possess are effectively the same in almost all members of a population. A gene is a segment of a long DNA (deoxyribonucleic acid) molecule that occurs at a particular place or locus in a chromosome or a mitochondrion (mtDNA). The *gene* is sometimes defined as the stretch of DNA that codes for a specific kind of protein molecule. During development, the DNA is transcribed into an intermediary molecule, messenger ribonucleic acid (mRNA), that is subsequently translated into a protein molecule. The DNA is

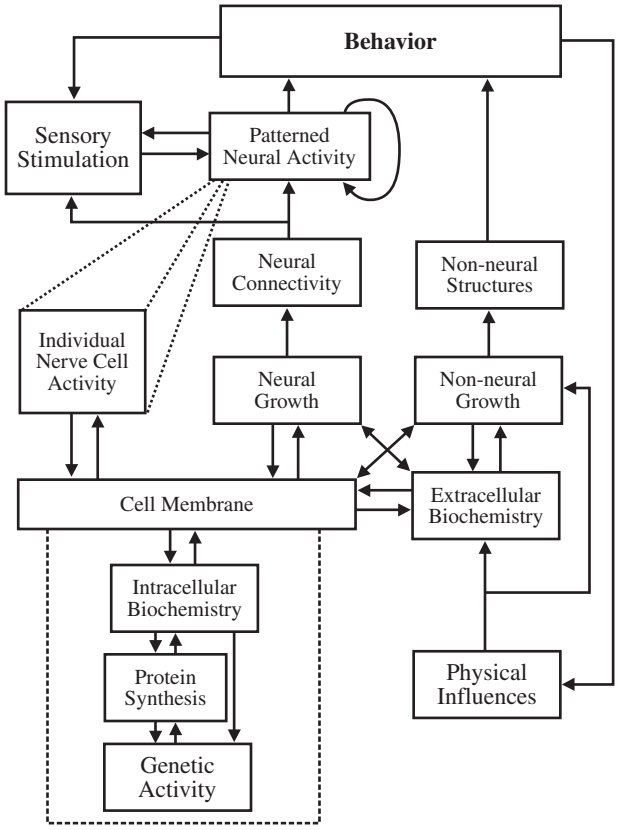


Figure 5.8 Model of behavioral development showing all factors involved in developmental construction of behavior and interactions among them, as proposed by Johnston and Edwards (2002). Nonneural elements encompass hormones (part of extracellular biochemistry), bones, muscles, feathers, and so forth. Sensory stimulation is influenced by behavior as the animal moves in its milieu, both producing and modifying the stimulation, but also by connectivity of the nervous system and the current state of neural activity. The elliptical arrow shows the effect of spontaneous neural activity. All enduring experiential effects on development act by modifying events at the cellular level, but there is no direct connection between genetic activity and behavior. Solid lines represent causal relations, whereas dotted lines indicate one thing is nested within another. *Source:* From "Genes, Interactions, and the Development of Behavior," by T. D. Johnston and L. Edwards, 2002, *Psychological Review, 109,* pp. 26–34. Reprinted with permission of the authors and the American Psychological Association.

a double helix consisting of two long chains of the nucleotide bases adenine (A), cytosine (C), thymine (T), and guanine (G), in a linear sequence that provides a code for the linear sequence of amino acids in a protein. At this molecular level, one might say that the gene *codes* for or *programs* the structure of the protein (Stent, 1981). What the consequences of this protein

may be for a cellular, neural, or behavioral phenotype depend strongly on the other genes possessed by the individual (Greenspan, 2004) and the sequence of environments encountered (Sokolowski & Wahlsten, 2001; Wachs, 1992). A specific gene sometimes occurs in two or more forms (alleles) that differ in one or more nucleotide bases in a population of individuals. If these different alleles code for slightly different amino acid sequences in the protein, and if the less common allele occurs with a frequency of at least 1% in the population, the locus is said to cause protein polymorphism. If not, the locus cannot give rise to noteworthy phenotypic differences among individuals. For many genes that are of critical importance for development, mutations are rapidly eliminated by natural selection, and almost all members of the population have the same allele.

Animal Models and Molecular Genetics

Recent innovations in molecular biology have made it possible to create viable mutations in genes where only one allele was known heretofore (Wynshaw-Boris, Garrett, Chen, & Barlow, 1999), or to insert an entire gene from one species into an early embryo from another species so that it becomes incorporated permanently into the genome to create a transgenic animal (Julien, Tretjakoff, Beaudet, & Peterson, 1987). Targeted mutations have greatly expanded the number of genes where allelic variants are available for research on brain and behavior. For example, in the mouse brain, the small molecule glutamate is a neurotransmitter that excites the postsynaptic neuron, and the receptor on the synaptic membrane that detects and reacts to glutamate is composed of several subunits, each of which can be encoded by a different gene. There are also gene-encoded molecules that interact strongly with glutamate or participate in the transport of glutamate at the synapse. As of 2004, researchers had identified 40 genes that encode either an enzyme, transporter, or receptor subunit involved in glutamate function in the nervous system (www.informatics.jax.org). Mutant alleles are known for 27 of these genes, and all but two cases have been targeted changes. Prior to the recent invention of targeting methods, spontaneous mutations had arisen and been identified in only two of these genes. One was the *Lurcher* mutation detected by Phillips (1960) and later shown to be an allele of a gene named *hotfoot* where several mutants were discovered over the years. Both are alleles of the *Glutamate receptor, ionotropic subunit delta 2* gene (*Grid2*). Also, the *eye blebs* gene was a severe mutation with widespread phenotypic effects discovered in 1969 (Beasley & Crutchfield, 1969), and it proved to be an allele of the *Glutamate receptor interacting protein 1* gene (*Grip1*). Meanwhile, no fewer than 58 alleles in 27 genes have been created by gene targeting, thereby greatly expanding the range of mutations available for research on glutamate function.

The elegant and even fantastic experiments that can be done with nonhuman genes and embryos are of course not available for research on humans. Although a detailed description of the usual sequence of events in early human prenatal development has been compiled, and similarities with other mammalian species are apparent (O'Rahilly & Müller, 1987), our most reliable information about mammalian embryogenesis comes from laboratory animals. Ethical considerations rightfully restrict what can be done to the human neonate in the name of science, and we rely on animals to teach us about many biological processes.

Considering the power of molecular biology to alter the genome, it is important to recognize the substantial degree of common origin or homology of humans and other animals at the molecular level. At least 99% of the genes found in humans also occur in mice (Mouse Genome Sequencing Consortium, 2002). Many genes in the lowly fruit fly also occur in both mice and humans (Adams et al., 2000; Sokolowski, 2001). As a general principle, developmental processes viewed at the molecular level tend to be broadly applicable across a wide range of species, whereas higher-level functions involving behavior or cognition are more apt to be species specific. A psychology of language development in children may find little benefit in attempting to converse with mice and fruit flies, whereas genetic analysis of synapses in the human nervous system can be illuminated by well-controlled studies of insect or worm nervous systems.

Mice are proving especially valuable in the search for animal models of human dysfunction because they are mammals and are readily adapted to a wide range of experimental alterations of their genes (Phillips et al., 2002; Tecott, 2003). While it has been possible to reproduce several single-gene defects of humans in a mouse model, it is also apparent that neurological disorders created in mice to mimic Alzheimer's or Parkinson's disease nevertheless differ in important ways from the human condition (Dodart, Mathis, Bales, & Paul, 2002). What appears to be an identical defect at the molecular level in a single gene often proves to have species-typical

features when that gene is placed in the context of a living organism.

Single Gene and Multiple Factor Research on Individual Differences

Among scientists who are primarily interested in individual differences within a species, two methodologies prevail (Greenspan, 2004). Some strive to detect and then understand the properties of a single gene and then elucidate the network through which that gene works to influence the lives of nerve cells and the behaviors of the organism (Wahlsten, 1999b). Others begin with phenotypic differences between strains of lab animals or relatives in human populations that they believe must differ at a large number of relevant genetic loci, each of which has a rather small influence on the phenotype. The phenotypes analyzed with this research are usually influenced substantially by several aspects of the environment, and the phenotype is then regarded as a complex, multifactorial character rather than a monogenic trait (Phillips et al., 2002). Those studying the influences of many genes of small effect would like to know the specific genes involved, but their methods are frequently incapable of detecting these. Instead, their immediate goal may be to characterize hereditary and environmental effects in broader terms.

Single gene effects are most easily studied when a mutation is available for research. The normal allele is sometimes termed the *wild type* and symbolized as +, so that animals captured in the wild state would typically have homozygous genotype +/+. The mutant allele might cause serious disruption of gene function and be symbolized –. If the mutation is recessive, only the homozygote –/– shows a phenotypic abnormality, whereas the heterozygote +/– appears and acts much as the +/+ animals. Researchers then measure a large number of phenotypes in animals with the +/+, +/–, and –/– genotypes to determine whether effects of the mutation are neatly localized or widespread. In most instances, a mutation having a large effect on certain phenotypes also changes the values of many other phenotypes, a phenomenon known as pleiotropic gene action. Even when we are considering variation in only one gene, the situation can be far from simple. Whether a specific mutation is recessive or dominant can depend on the thing we choose to measure (Moore, 2001) and the stage of development when the observations are made. The consequences of a mutation usually depend on genes present at other loci (epistasis) as well as the environment (Greenspan, 2004; Scriver & Waters, 1999; Sokolowski & Wahlsten, 2001).

In past decades, the list of readily available mutations for research was short. Most of them arose spontaneously in a lab from unknown causes. The supply of spontaneous mutations is now being augmented by chemical mutagenesis; male mice are fed a substance such as ethylnitrosourea that induces mutations at a high frequency more or less randomly across the genome. Large enterprises have been established to screen their offspring for mutations in thousands of mice (Belknap et al., 2001; Moldin, Farmer, Chin, & Battey, 2001; Nadeau & Frankel, 2000). By focusing on a specific phenotypic domain such as activity, anxiety, or memory, researchers hope that many if not all of the genes that are most important for those functions might be identified.

Most mutations with large effects must be painstakingly propagated in sheltered conditions in the laboratory. The spectacular features of their phenotypic effects make them easy to study with small samples of animals, but the widespread effects of seriously debilitating mutations make the experiments difficult to interpret. Scientists working with fruit flies have found some very interesting genetic variations in wild populations that lead to less dramatic and viable alterations in behavior, such as how far the larvae move when feeding (Sokolowski, 2001) or how readily the flies adapt to changes in day length (Greenspan, 2004). Greenspan (1997) has argued that these genes with smaller effects should be less likely to alter a wide range of phenotypes, thereby making it easier to elucidate the network of other genes with which they work closely.

Aspects of the brain and behavior that are influenced by numerous polymorphic genes as well as environmental variation are termed *quantitative* or *complex traits.* Only within the past decade has the identification of specific genes involved in complex traits become a realistic goal (Belknap et al., 2001; Flint, 2003; Phillips et al., 2002). The discovery of thousands of phenotypically neutral marker loci spread widely across the entire genome has been a boon to linkage analysis, and generous funding of research projects involving large samples of animals, especially mice, has provided the necessary statistical power to detect linkage with a gene that may be responsible for only 5% of the phenotypic variance in a trait (Crabbe, 2002). When the data indicate that a gene relevant to a quantitative trait is located somewhere in an interval along a particular chromosome, the region is referred to as a quantitative trait locus (QTL). Usually

the interval is so wide that hundreds or even thousands of genes are to be found there, and the challenge then is to narrow the search and pinpoint which specific gene is the basis for the QTL. This final step has proven to be extremely difficult (Nadeau & Frankel, 2000). Nevertheless, this approach is capable of bridging the gap between single gene and multifactorial approaches.

Classical methods of selective breeding, strain comparisons, and cross-breeding with lab animals as well as twins and adoption in humans can reveal interesting things about the involvement of nonspecific hereditary and environmental variation, but in themselves they cannot reliably point to any specific gene or even define the number of polymorphic genes that influence a behavior.

Three Sources of Individual Differences

Although it is often presumed that all differences between individuals emanate from heredity, environment, or a combination of the two, there are now good reasons to believe that a third source may exist that is neither hereditary nor environmental (Finch & Kirkwood, 2000; Whitelaw & Martin, 2001). Instead, interesting differences may emerge from within the developing organisms but not be transmitted to the next generation (Collins, 1985; Layton, 1976; Lupski, Garcia, Zoghbi, Hoffman, & Fenwick, 1991; Wahlsten, 1989). The influence of a third factor, referred to as the unknown factor *X* by Haldane (1938), is sometimes termed *developmental noise* or *randomness* to convey the idea that it does not show the regularities typical of genetic effects (Lewontin, 1991). The concept may be invoked in situations where genetically identical individuals are reared in unusually uniform environments but nonetheless differ markedly in phenotypic outcomes (Gärtner, 1990; Spudich & Koshland, 1976). This possibility of a third source of variation is inherent in Schneirla's (1957) concept of "circular relationships of self-stimulation in the organism" (p. 86) whereby the organism is "interactive with itself."

For example, the corpus callosum is absent in BALB/c and strain 129 mice, wherein 20% to 50% of the animals in a genetically uniform strain are clearly defective, but the other littermates are normal (Wahlsten, 1989; Wahlsten, Metten, & Crabbe, 2003). Which mouse will be missing the corpus callosum as an adult is determined prior to birth. The spatial location in the uterus of defective and normal embryos in a litter of mice exhibits a random pattern and is unrelated to a wide range of prenatal environmental variations (Bulman-Fleming & Wahlsten, 1991). Detailed studies of the growth of axons in the embryo cerebral cortex (Ozaki & Wahlsten, 1993) indicate that a distinct threshold for the formation of the corpus callosum occurs because of the relative timing of two processes: (1) growth of axons toward the middle of the brain and (2) formation of a tissue bridge leading to the opposite hemisphere. Small differences in the timing move an individual to one side of the threshold or the other, thereby generating a random distribution (Wahlsten, Bishop, & Ozaki, in press). The extent of random phenotypic variation depends on the organism's heredity as well as its rearing environment (e.g., Wahlsten, 1982), yet this third source of individual variation arises from within the developing organism and is distinct from heredity and environment.

The Nature of Heredity

Developmental behavior genetics seeks to understand the role of heredity in the development of an organism's nervous system and behavior. To address this issue, it is important to state what is meant by heredity. An entity is usually defined by contrast with what it is not. Heredity is not environment. Heredity (H) is inside the organism, whereas environment (E) is outside it. Unlike the third source that is also internal, heredity is transmissible across generations. The formula seems simple enough until one begins to dig more deeply into the data on development.

Heredity at Conception

At conception of a one-cell embryo, a clear distinction between H and E can be perceived. Heredity is everything transmitted from the parents. Every speck of matter in the embryo, the entire organism, is inherited; the chromosomes in the nucleus, the mitochondria, the endoplasmic reticulum, and other organelles in the cytoplasm, and even the cell membrane are integral parts of heredity (Ho, 1984). Environment is then the exterior, those aspects of the surroundings that impinge on the embryo but are not part of it. This definition of H and E provides an unambiguous, exhaustive partition of everything in the vicinity of the new organism. For developmental theory, it is more satisfying than the assertion that heredity consists only of DNA molecules, because this dogma leaves most of the embryo out of the picture or classifies the cytoplasm inside the embryo as part of the environment.

Even this definition of H and E at conception entails difficulties. The entire one-cell embryo is transmitted from the parents but not all of it is in turn transmissible to the next generation, and some of what is obtained from the parents was not possessed by them as heredity. Consider cases where a human embryo has an extra chromosome, such as trisomy 21 (Down syndrome) or the XYY male. These arise *de novo* during germ cell formation; they do not afflict the parent, and they are rarely passed on to the next generation. Thus, there can be a defect of the substance of heredity that is not itself hereditary. Such phenomena reveal the frailty of our attempts to impose rigid definitions on nature.

To demonstrate the importance of some aspect of heredity for development, one must raise organisms with different heredities in the same environment (see Sokolowski & Wahlsten, 2001). Similarly, the role of environment can best be revealed by raising organisms with the same heredity in different environments. It is sometimes argued (e.g., Lorenz, 1981), that depriving a bird of the opportunity to hear the song of a conspecific can prove the song is encoded in the genes if the bird sings well despite the lack of a skilled tutor. Notwithstanding the Nobel prize conferred on Lorenz, his logic was flawed (Johnston, 1988; Lehrman, 1970; Lerner, 1992). The sensory deprivation experiment tests the importance of only one specific feature of the environment that involves learning by observation, and it reveals absolutely nothing about any gene. Likewise, some psychologists argue that monozygotic (one-egg or MZ) twins reared apart can reveal the importance of genes for mental development (Bouchard & McGue, 2003). This logic is also flawed. MZ twins, having the same heredity, provide a good opportunity for evaluating effects of different environments; a difference between two co-twins could not originate in their different heredities, but concordance of the two could reflect identical H, highly similar E, or, most likely, similarity of both factors.

Studying a Difference in Heredity

There is no way to show the importance of heredity as a whole for development in general, but elegant experiments can prove that a specific difference in heredity leads to a distinct difference in development. Perhaps, the clearest demonstration is provided by a genetically pure strain of mice created by over 60 generations of mating brother and sister. At every genetic locus on all chromosomes, each animal is homozygous for the same allele. This extraordinary purity allows the researcher to produce hundreds or even thousands of mice with the same genotype. The purity is ephemeral, however; a rare, spontaneous mutation sometimes transforms one allele into a new version of the gene that does not function very well and may even lead to a gross malformation of the brain or a bizarre behavior. The mutant animal can be compared with normal siblings, and any major difference in phenotype can be attributed to a difference in a single gene. These coisogenic mice are the same at every other genetic locus. Furthermore, they are conceived in the same mother at the same time and nurtured by the same parents in the same laboratory cage.

The *diabetes* mutation (*db*) in mice originally occurred in the strain named C57BL/6Ks. It is recessive; an animal exhibits the diabetic and obesity phenotype only if it inherits two copies of the mutation, one from each parent, and has genotype *db/db*. The design of this experiment then consists of groups that differ only at the *db* locus on chromosome 4, and the 25 g difference in their body weights and elevated serum levels of glucose and insulin seem to be attributable to the difference at just one genetic locus. The logic of the experiment is clear enough: The *db/db* genotype must cause the diabetes and obesity because the genetically different siblings were conceived and reared in the same environment. Nevertheless, the phenotypic difference is environment dependent. If the *db/db* mice are "pair fed" by feeding them the same amount of food that their +/+ siblings ate on the previous day, the genetically mutant mice no longer become obese or show symptoms of clinical diabetes (Lee & Bressler, 1981). The *db* gene does not code for diabetes. Instead, the *db/db* genotype yields mice that are more sensitive to their dietary environment than their normal siblings.

The *obese* mutation (*ob*) on chromosome 6 also causes obesity and diabetes when mice are reared with free access to food in the lab, but restricting the diet of *ob/ob* mice does not prevent the symptoms of diabetes. Researchers discovered that the normal allele of the *ob* gene codes for a previously unknown protein named leptin that is synthesized in white fat cells and then circulates to the brain via the blood (Zhang et al., 1994). Administering leptin to *ob/ob* mice prevents their obesity and diabetes, but leptin has no beneficial effect on *db/db* mice. Through a series of sophisticated experiments (see Wahlsten, 1999b), it was established that the normal form of the *db* gene codes for the structure of the receptor molecule that detects leptin in the hypothalamus. The gene was renamed the leptin receptor (*Lepr*) gene, and the mutation is now expressed as an allele of that gene ($Lepr^{db}$). Likewise, we now refer to the *ob* mu-

tation as an allele of the leptin gene (Lep^{ob}). In this case, knowing how the two genes interact with each other physiologically helps to understand the specific environmental factor that is most important for the phenotypic expression of the mutant genotype. The functioning of the two genetic factors could only be comprehended by learning about their interactions with each other and the environment.

There is no human equivalent to coisogenic mice. When different alleles of a specific gene can be detected from their protein product or from the DNA itself, it is possible to compare two groups of individuals who definitely differ at a single locus, but they will not be identical at other genetic loci or in their upbringing. This heterogeneity creates a danger that the allelic difference in one gene will be correlated with some other genetic or even an environmental difference that is the effective cause of a difference in behavior. Apparently, this happened when alcoholism was found to be associated with a particular allele of the dopamine type 2 receptor (DRD2) gene. The frequency of the allele also differs greatly between ethnic groups that differ as well in the rate of alcoholism, creating a spurious correlation. When ethnically homogeneous groups were studied (Kidd et al., 1996) or diversity within a family was assessed (Wong, Buckle, & Van Tol, 2000), the association of alcoholism with the DRD2 alleles vanished.

An Operational Definition of Heredity

Defining heredity at conception appears to be reasonably straightforward, but, as development progresses, the distinction between H and E becomes less apparent (Rose, 1998). This can be appreciated by examining some of the standard methods used to manipulate and preserve variations in heredity in animals. An inbred strain is created by breeding within a family for dozens of generations. Two inbred strains maintained in the same laboratory environment differ mainly because of their ancestries, the specific parents that served as founders of the strains almost 100 years ago (Russell, 1985). Likewise, selective breeding entails mating of a male and female that both score high or both score low on some test. After only a few generations of selective mating and rearing in the same laboratory, the high and low lines usually diverge substantially, thereby revealing that at least part of the original phenotypic variation in the foundation population may reflect hereditary differences.

Consider an easily measured phenotype, the size or weight of the adult brain. Inbred strains differ considerably, ranging from 410 mg for DBA/2J to 520 mg for BALB/cJ (Wahlsten, 1983). Brain size is an outcome of development; it is not encoded in the DNA and it is strongly influenced by nutrition. If the DBA/2J and BALB/cJ strains differ in brain size by about 100 mg, it may seem reasonable to attribute this phenotypic difference to their different heredities if they are reared in the same environment. What is meant by heredity in this context?

The term *heredity* is used in two ways in the scientific literature. One invokes the dogma that all heredity consists of genes or DNA molecules, which requires that any phenotypic difference between strains be deemed genetic. The other invokes an operational definition; if the strain difference reflects a difference in heredity, then heredity in the particular experiment includes *everything that actually differs between the strains*—everything except the laboratory environment they share in common. This latter approach is very much a developmental one because it takes into account all of the factors that could reasonably influence the development of the brain.

Non-Mendelian Heredity

The DNA molecules in the chromosomes (both the autosomes and sex chromosomes), as well as those in the mitochondria of the cytoplasm, are important components of heredity. The autosomes in the cell nucleus are transmitted via the laws of Mendelian inheritance, whereas the genes resident in the mitochondria are transmitted solely via the female. Neurological disorders from defective mitochondrial DNA, such as Leber's optic neuritis in humans, can affect both the male and female offspring but cannot be transmitted via the male (e.g., Wallace et al., 1988). The different mtDNAs carried by certain strains of mice can influence several kinds of behavior (Roubertoux et al., 2003). Another kind of inheritance from parent to offspring involves DNA or RNA of viral origin. Mouse leukemia virus is passed to the embryo via the ovum, and mouse mammary tumor virus is bequeathed to the neonate postnatally through the milk (Grun, 1976). Many strain-specific cancers in mice are transmitted "vertically" from parent to offspring rather than "horizontally" between nonrelatives. These non-Mendelian hereditary factors also interact with the host genome; they more readily infect, proliferate, and transmit to offspring in some strains than in others. Unless special experiments are done, the strain-specific viruses endure for many generations and appear as an integral part of heredity. For example, the C3H/HeJ strain of mice has carried the mouse mammary tumor virus since its inception in 1920, but in

2001 the staff at the Jackson Laboratory eliminated the virus from this strain by fostering newborn mice to lactating females free from the virus (http://jaxmice.jax.org/info/bulletin/bulletin07.html).

The embryo of a certain inbred mouse strain develops in a uterine environment of that strain, and this can contribute to apparently hereditary differences between strains. After birth, the neonate drinks the milk and lives in a nest provided by a female of the same strain. All its social interactions from an early age are with mice of the same strain. Although these features are undoubtedly environmental, they differ substantially between inbred strains and can cause strain differences in the brain or behavior. Viewing the maternal environment as a part of heredity may seem like an unfortunate confusing of two distinct concepts. Nevertheless comparisons of inbred strains and selectively bred lines that we ordinarily regard as demonstrating effects of heredity do entail differences in maternal environment. Either the maternal milieu is part of heredity in these simple experiments, or strain comparisons cannot by themselves prove the importance of a difference in heredity, let alone a genetic influence. It may be argued that ultimately the maternal environment itself depends on strain-specific genetic activity. Undoubtedly, the mother's uterine environment depends in many ways on her genotype as well as her own environment, and her environment in turn has depended on the grandmother's genotype and maternal environment. From the standpoint of individual development, however, the mother's influences on embryonic development via the genes passed to the new organism and via the uterine environment are quite distinct. The genetic part of heredity exists in the embryo's interior; the maternal environment impinges on its exterior. Because of the confounding of the embryo's genotype, its cytoplasm, and its prenatal environment, most of the commonly employed research designs with standard strains or lines of laboratory animals cannot prove that a strain difference in phenotype arises solely from a difference in genes located in the nucleus of the zygote.

Dissecting Heredity

Whether a particular component of heredity is important for a specific phenotypic difference between strains can only be ascertained with experimentation. Reciprocal hybrid crosses, F_2 hybrid crosses, and backcrosses can demonstrate the contributions of autosomes, sex chromosomes, mtDNA, cytoplasmic organelles, and maternal environment (Roubertoux et al., 2003; Sokolowski & Wahlsten, 2001). Using these methods, it has been shown that F_2 hybrid mice develop faster than inbred mice partly because they benefit from a superior hybrid maternal environment (Wahlsten & Wainwright, 1977), and that BALB/c mice have large brains partly because of the BALB/c maternal environment (Wahlsten, 1983). The importance of the prenatal maternal environment can be assessed by grafting the ovaries of either of two inbred strains into an F_1 hybrid female, then fostering to a surrogate mother at birth (Carlier, Nosten-Bertrand, & Michard-Vanhée, 1992). Carlier, Roubertoux, and Pastoret (1991) combined the reciprocal crossing and ovarian grafting methods and found that the reciprocal hybrid crosses developed differently in inbred and F_1 hybrid maternal environments. Thus, there can be interactions between different components of heredity, and it is generally not meaningful to state that a certain percentage of a strain difference is simply attributable to each component of heredity, such that the percentages add to 100%.

Separating the Effects of Heredity and Environment

From its inception, developmental psychology has been keenly interested in the role(s) of heredity (H) and environment (E). Numerous methods have been devised to separate their effects both experimentally and statistically. At the same time, many theorists regard these two entities as fundamentally inseparable. The naturalist John Muir (1911/1967) expressed the holistic doctrine admirably when he taught: "Whenever we try to pick out a thing by itself, we find it hitched to everything in the universe." Developmental systems theory also emphasizes relationships between things, and it attributes the properties of a living system to the dynamic interactions among its parts and between different levels (Figure 5.8; Ford & Lerner, 1992; Gottlieb, 1992; Johnston & Edwards, 2002; Oyama, 1985).

Separating heredity and environment may appear to be a rather easy task from the standpoint of a reductionist theory because the parts of a system are held to possess inherent and intransigent properties that can be added up to characterize the whole organism (the whole equals the sum of its parts). For developmental systems theory, however, the boundaries drawn for convenience at one moment are expected to become somewhat fuzzy and transient as development proceeds (Moore, 2001; Rose, 1998). Given a competent embryo in an adequate

environment, the organism will differentiate, assimilate its environment, and grow. The question of whether H or E is more important for its development is nonsensical because both are absolutely essential. An embryo without an environment is inconceivable.

Heritability and Additivity

The logic of the simple two-group experiment with coisogenic mice is inscrutable. Because all else seems to be equated, must not the precise numerical magnitude of the difference between group mean scores be attributed solely to the genetic difference? In reality, this inference will be valid only in one situation: when the effects of H and E are strictly additive. If the value of the phenotype is indeed the arithmetic *sum* of components attributable to H and E, then the difference between the group mean phenotypes equals the difference between the group values of H, irrespective of the value of E, as the logic of the experiment implies. If the two factors are not additive and are multiplicative instead (a form of H × E interaction), the group difference in mean phenotypes depends on the difference in H values as well as the specific value of E (see Figure 5.9). Thus, although the magnitude of the difference in heredities is certainly of critical importance under either situation, when H and E are not additive the observed group difference depends just as much on the one environment chosen for the study as it does on the two genotypes, and the observed group difference is then specific to the environment common to all subjects in the study.

A simple two-group experiment cannot reveal whether H and E are additive or not. Some kind of factorial design is required to test for the existence of interaction or interdependence of H and E (Sokolowski & Wahlsten, 2001). The crucial point is that nonadditivity of H and E will have major consequences for the numerical results of the two-group experiment, even though the interaction effect cannot be perceived in the data when only one factor is manipulated. The elegant study of coisogenic mice reared in the same laboratory environment is an excellent method for demonstrating the importance of a difference in heredity, but, in principle, it cannot truly separate the effects of heredity and environment quantitatively if they are not separable developmentally.

The same considerations apply to any study of environment with a single inbred strain; the results may illustrate a genotype-specific reaction to environment, but there is no guarantee at all that its shape will be the same for other strains. When there is heredity-environment

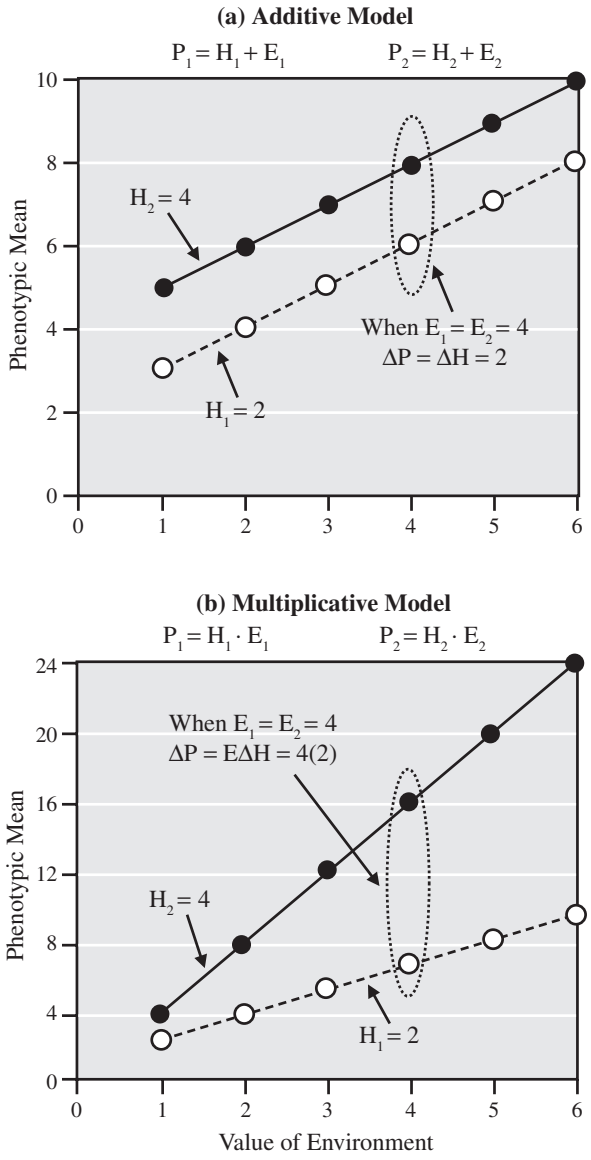

(a) Additive Model
$P_1 = H_1 + E_1$
$P_2 = H_2 + E_2$
Phenotypic Mean
$H_2 = 4$
When $E_1 = E_2 = 4$
$\Delta P = \Delta H = 2$
$H_1 = 2$
(b) Multiplicative Model
$P_1 = H_1 \cdot E_1$
$P_2 = H_2 \cdot E_2$
When $E_1 = E_2 = 4$
$\Delta P = E\Delta H = 4(2)$
$H_2 = 4$
$H_1 = 2$
Value of Environment

Figure 5.9 Two models of the quantitative relation between hereditary (H) and environmental (E) factors that jointly determine the magnitude of the phenotype (P). Independent groups of animals from strains 1 and 2 are reared in six environments having values spaced equally apart. (A) In the additive model, the difference between strain means is 2 units in every environment. (B) In the multiplicative model, the difference between strain means depends strongly on both H and E values, such that under environmental conditions where E = 4 units, the strain difference is 8 units. If an experiment involves two strains reared in only one environment, the data may appear to indicate that the strain difference is a result purely of the genetic difference. Nevertheless, in the presence of gene-environment interaction, the size of the difference depends on both H and E.

interaction, the degree of apparent heritability of some characteristic depends on the specific rearing environment, and the environmental plasticity depends on the organism's heredity, whether or not the experimental design is capable of revealing this (Wahlsten, 1979).

Numerous factorial experiments involving genetically different strains reared under different conditions have been done with fruit flies, rats, and mice. After a thorough review of the available literature on mice, Erlenmeyer-Kimling (1972) concluded that "gene-environment interactions are numerous and treatment effects are frequently reversed in direction for different genotypes" (p. 201). Since then, many other dramatic demonstrations of nonadditivity have been published. Consider the results of an experiment by Hood and Cairns (1989) with two strains of mice that had previously been bred selectively for either high or low frequency of fighting when reared in isolation. They then reared the strains either in isolation or in social groups

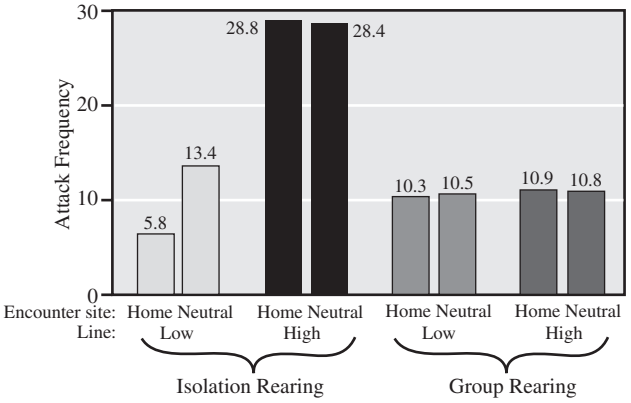


Figure 5.10 Mean attack frequency against an intruder mouse by males of two selectively bred lines of mice reared after weaning either in isolation or in social groups. The encounter took place in either the test male's home cage or a neutral location. Encounter site had no appreciable effect on test results. During the original selective breeding experiment, males were reared in isolation prior to testing, and again in this experiment there was a very large line difference when mice were reared in isolation. When males were reared in social groups with other males of the same line, however, the attack frequency of high line males was greatly reduced, and a difference between selectively bred lines was no longer apparent. The heredities of the mice had not been changed by rearing conditions, but the hereditary difference between lines was no longer manifest in behavior under social housing conditions. *Source:* From "A Developmental-Genetic Analysis of Aggressive Behavior in Mice: Pt. 4. Genotype-Environment Interaction," by K. E. Hood and R. B. Cairns, 1989, *Aggressive Behavior, 15,* pp. 361–380.

(see Figure 5.10). The strain difference was very large with isolated mice, which typically were much feistier, but disappeared when the animals were reared socially in groups. Thus, there is no *general* sense in which one can say that one of the strains is more aggressive than the other.

When there is H x E interaction, the strain-specific norms of reaction will differ. However, it does not follow that the norm of reaction is itself genetically encoded. The most we can claim is that a *difference* in the two norms of reaction results from a *difference* in heredity when the strains are reared in the same environment until the time in life when the experiment with different environments begins.

The norm of reaction, which is characteristic of an entire organism carrying thousands of genes through a multifaceted environment, can itself be modified by the environment and is not determined exclusively by the genotype. For example, when the ovaries of an inbred BALB donor mouse are grafted into either a BALB or an F_1 hybrid female and then the host female is mated with a BALB male, embryos and later neonates that are all genetically BALB can be observed in two maternal environments (Bulman-Fleming & Wahlsten, 1988). Adult brain size depends on litter size prior to weaning; mice from larger litters have smaller average brain size. Litter size is an environmental factor because inbred mice from smaller and larger litters are the same genetically, but the slope of this norm of reaction is steeper in the inbred than in the hybrid maternal environment (Figure 5.11).

The typical heritability analysis that is so familiar in quantitative behavior genetic studies of human traits attempts to assess the percentage of phenotypic variance in a population that is attributable to genetic variance. This analysis assumes that there are many genes with small effects, scattered widely across the chromosomes, and that they combine additively with each other (no gene-gene interaction) and with the environment (no H x E interaction) to determine the phenotype of an individual. However, these assumptions are not consistent with current knowledge from molecular and developmental biology (Greenspan, 2004; Sokolowski & Wahlsten, 2001; Wahlsten, 1994). Furthermore, the presence of real H × E interaction can markedly alter the estimation of parameters in a statistical model that assumes the absence of interaction (e.g., Tiret, Abel, & Rakotovao, 1993; Wahlsten, 1990), while effects of the prenatal maternal environment can substantially effect the apparent degree of "heritability" in a twin study (Devlin, Daniels, &

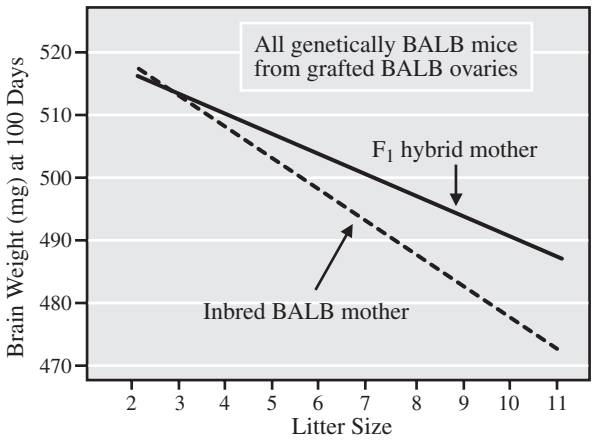


Figure 5.11 Brain weight in 100-day-old mice from the highly inbred BALB strain. All were derived from BALB ovaries grafted into a host female who was later mated with a BALB male. The host female was either a genetic BALB or a hybrid between BALB and the C57BL/6J strain. Hybrid mice are markedly superior to inbred mice in their reproduction and nurturing of offspring. For both kinds of mothers, mice from smaller litters had substantially larger adult brain size. The slope of the linear norm of reaction that expresses the environmental effect on brain growth was itself dependent on the maternal environment. Inbred mothers were relatively less capable of nurturing larger litters. *Source:* From "Effects of a Hybrid Maternal Environment on Brain Growth and Corpus Callosum Defects of Inbred BALB/c Mice: A Study Using Ovarian Grafting," by B. Bulman-Fleming and D. Wahlsten, 1988, *Experimental Neurology, 99,* pp. 636–646.

Roeder, 1997). It is even possible to devise a plausible model lacking any genetic variation at all that shows high "heritability" with conventional quantitative genetic analysis (Guo, 1999).

Documenting the Norm of Reaction

With an inbred strain, dozens of animals having the same genotype can be randomly assigned to several different rearing conditions. The C57BL/6J strain is not usually obese, but rearing them on a diet high enough in fat can cause obesity and physiological diabetes, as indicated by greatly elevated blood glucose and insulin (Surwit, Kuhn, Cochrane, McCubbin, & Feinglos, 1988). Although insulin levels are strongly modified by diet in C57BL/6J mice, other strains are far less sensitive to dietary fat. C57BL/6J mice are usually not vulnerable to seizures induced by a loud noise, but when they are exposed to a priming noise at one of 15 different ages, it is found that exposure on any day from 14 to 20 days of age leads to severe sound-induced seizures at 28 days of age (Henry & Bowman, 1970), whereas DBA/2J mice tend to seize without priming (an example of equifinality). The degree of paw preference in the C57BL/6J mouse strain can be substantially altered when they must reach for food in an asymmetrical environment, whereas mice of the CDS/Lay strain tend to work with the preferred paw and resist the pressure to switch (Biddle & Eales, 1999).

When many different environmental conditions are examined, an extensive profile or norm of reaction can be documented (see Gottlieb, 1995; Platt & Sanislow, 1988; Sarkar, 1999). The norm of reaction expresses phenotype as a function of environment for a specific genotype, and a complete norm of reaction for one genotype would involve variation along many relevant dimensions of environment. When the profiles of reaction to different environments differ among individuals having different genotypes, this demonstrates gene-environment interaction. If the norms of reaction are virtually the same for two genotypes, alternatively, genes and environment could nevertheless interact intimately in a physiological sense, even though the data set would not show gene-environment interaction in the statistical sense.

Replicated genotypes are essential for documenting a genotype-specific norm of reaction. An elaborate environmental experiment of this kind is not feasible with most organisms that have not been highly inbred, but a norm of reaction can sometimes be defined as an average across genetically different individuals, provided random assignment to condition is employed. For example, wild alligator eggs taken from the same clutch and incubated in a laboratory at six different temperatures revealed that above 32 degrees C all become male, and below 32 degrees C all become female (Ferguson & Joanen, 1982). Temperature dependent sex determination is widespread in reptiles, and different species have different critical temperatures for switching to the male or female pathway (Bull, 1983; van der Weele, 1995).

Random assignment of human volunteers to different treatment conditions could potentially reveal an averaged norm of reaction, because random assignment insures that group differences are not correlated with genetic differences (Blair & Wahlsten, 2002). That is, good research on mild environmental effects can be done without genetic homogeneity among the subjects. In this case, however, the variability within treatment conditions will reflect both genetic and environmental differences among individuals. The profile of group

average scores may be thought of as an average of numerous individual norms of reactions, whereas the within-group variance reflects departures of individual norms of reaction from the group average (Figure 5.12). This interactionist perspective on designed experiments conflicts with the usual analysis of variance (ANOVA) model used to evaluate the results statistically. We expect that individuals in the same treatment group will differ in their response to the experimental treatment, partly because of their genetic differences, whereas the ANOVA model posits that all individuals in a group are affected equally by a treatment and individual differences within a group arise from things that are independent of treatment.

Separating Heredity and Environment in Humans

The basic ideas of the norm of reaction and heredity-environment interaction apply to any species: protozoa, insects, vertebrates, and even plants. Human beings have no special properties that render heredity and environment additive. Nonetheless, it is often claimed by quantitative behavior geneticists that twin and adoption studies can separate the effects of H and E. The assertion that the adoption method can effectively separate H and E presumes that the prenatal environment is of no account for individual differences or that the uterine environment of all women is virtually the same. This is not at all realistic (Boklage, 1985; Lerner, 1995, p. 152). The state of the mother's health and nutrition during pregnancy has a major impact on the brain development of the fetus, and every mode of sensory experience except vision is active in the fetus during the last trimester of human pregnancy (e.g., Busnel, Granier-Deferre, & Lecanuet, 1992; DeCasper & Spence, 1986; Gottlieb, 1971b). Precisely how significant each of these effects may be in the context of an adoption study cannot be determined when rigorous control of conditions is lacking. Prior to being separated from its biological parent(s), the fetus and then the child lives in an environment provided by its genetic benefactors. Consequently, the adoption method cannot conclusively separate the effects of H and E.

In some situations, adoption provides an excellent means to study differences in the postadoption environment. For example, Schiff, Duyme, Dumaret, and Tomkiewicz (1982) compared school performance and IQ test scores of French siblings who had the same poverty-stricken mother; one or two children were adopted into a high socioeconomic status (SES) home, while another child remained with the mother. The mean IQ of the adoptees was elevated by 16 points. The two groups had

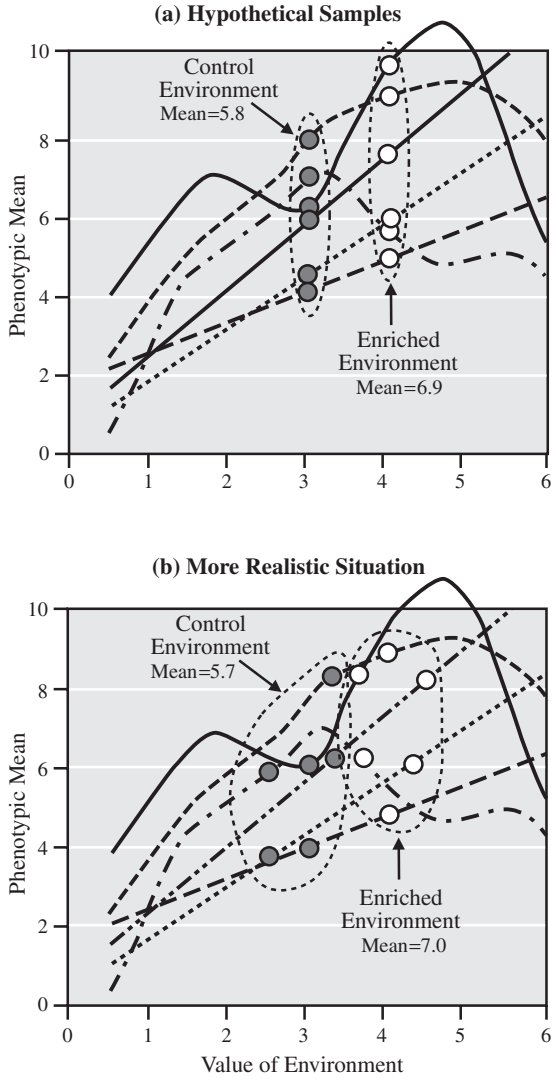


Figure 5.12 Test scores for six individuals under two environmental treatment conditions when the shape of the norm of reaction relating test score to environment is different for each genetically unique person. (1) If each person in a group is indeed exposed to exactly the same amount of environment, it is evident that environmental enrichment will have different magnitudes of effect on different individuals. Some might even do worse than under the control condition. Group means would then be averages of points on several different norms of reaction. (2) It is more likely that people in a particular treatment condition would not experience exactly the same value of environment, although values under the enriched condition would generally be higher. Nevertheless, group mean test scores would differ under the two conditions.

substantially different postadoption environments but were matched for many factors acting prior to adoption. Capron and Duyme (1989) employed the same approach to conduct a 2×2 factorial study of pre- and postadoption SES in relation to later IQ. Contrary to the opinion that

their study effectively separated H and E (McGue, 1989), the authors explicitly recognized that preadoption H and E were confounded.

Outstanding control of heredity can be achieved in humans with genetically identical monozygotic (MZ) twins, but separation of the effects of H and E is not possible because MZ twins share a common prenatal and early postnatal environment. When MZ twins are reared in different homes, there may be an opportunity to assess the plasticity of behavior, provided the environments are sufficiently dissimilar to make the test reasonably powerful. Unfortunately, for research, the environments of "separated" MZ twins are often quite similar because they are reared in branches of the same family, in the same neighborhood, or in similar SES homes in the same culture (Farber, 1981; Taylor, 1980). Comparison of MZ twins reared apart clearly points to the importance of nongenetic factors when the twins are substantially different; but when they show a close phenotypic resemblance, it is usually not possible to know why. A high correlation of test scores of MZ twins reared apart provides support for the hypothesis of a strong genetic influence on behavior but cannot prove it true.

Comparing MZ versus dizygotic (two-egg, or DZ) twins reared in the same home involves a similar confounding of H and E. The heredities of MZ twins are surely more similar than those of DZ twins, and so are their environments. Consequently, the elevated phenotypic correlations of MZ twins very likely reflect their common experiences to some unknown extent (Hoffman, 1991). Precisely what fraction of an observed correlation is attributable to nongenetic similarity cannot be determined unless psychologists provide a good measure of the environments that are specifically pertinent to the development of the behavior being studied (Wachs, 1992).

Thus, the adoption and twin methods provide useful and well-controlled situations for studying environmental effects on development, even though they cannot cleave precisely the effects of heredity and environment. Adoption and twin studies can provide evidence suggestive of genetic effects on behavior, but the only conclusive way to prove a genetic effect on human behavior is through linkage analysis, whereby behavioral variation in a family is highly correlated with alleles at a marker locus occurring at a specific location in the DNA of a chromosome. Numerous genes with a major impact on human mental development have been mapped to specific chromosomal loci, and these are typically quite rare in the population because their effects are often devastating. Those hypothetical loci with more subtle effects in the normal range of human behavioral variation remain elusive, despite much searching by intrepid gene hunters.

The Scope of Gene-Environment Interactions

Heritability analysis is constructed on a foundation of additive models that presume genetic and environmental effects are biologically separate and statistically independent. Yet, molecular genetic research has established beyond doubt that the actions of numerous genes are regulated by environmental conditions (Gottlieb, 1998). Well-controlled experiments with various species of plants and animals have shown many times over that sensitivity to environmental change is genotype dependent (norm of reaction) and that the consequences of allelic variation at one genetic locus can be understood only in relation to genes at other loci (epistasis or gene-gene interaction). As Nijhout (2003, p. 418) trenchantly observed: "everything we know about the mechanisms by which genes affect traits suggests that a simple additivity hypothesis must be wrong." Genes affect other things and are themselves affected as parts of a multidimensional, nonlinear biological system.

In the search for single genes that are important in medical and psychiatric disorders, the interactionist perspective is proving to be fruitful and has gained widespread credibility. In an editorial in *Science,* Brenner (2003) looked forward to a future when "those who have a genetic background that makes them especially liable to one of the diseases of our civilization will have to learn how to take extra care." It is now recognized that the search for major genes involved in complex disorders is especially difficult because "multiple genes and their interaction with each other and with the environment are involved" (Edenberg et al., 2004). A recent study of depression placed the hypothesis of gene-environment interaction in the forefront of their study and discovered that people carrying the short allele in the promoter region of the serotonin transporter gene (5-HTTPR) were more likely to develop depression when they experienced several stressful life events, whereas those with the long allele were less likely to become depressed even when under considerable stress (Caspi et al., 2002). The idea of interaction can even be found in the popular press, for example, a report relating a higher risk of later schizophrenia in fetuses exposed to maternal flu during gestation speculated this would occur only "in a small number of genetically susceptible fetuses" (Tanner, 2004).

Nevertheless, additive models continue to be the stock-in-trade in the quantitative genetic analysis of human behavior and cognition. The principal rationale for this countercurrent is that, while probably real, gene-environment interactions are so small statistically that they can safely be ignored. It has been claimed that tests of H × E interaction pertinent to human psychological characteristics have been tried but consistently failed to find any such effects (Detterman, 1990; Plomin, 1986). In reviewing twin studies on alcoholism that sought to assess interaction, Heath and Nelson (2002) observed that "few studies have been able to document the importance of such effects." Scarr (1992) argued that interactions are commonly observed in research with lab animals because strong environmental treatments are employed that are outside the normal range of variation, whereas interactions over a more moderate range of environments are generally too small to be of concern to the theoretician.

There are three issues involved in these pleas. First, because there are no sources of humans with identical genotypes that can be assigned to different environments, the presence or absence of H × E interaction in studies of human mental abilities is effectively unverifiable. Second, the usual two-way analysis of variance methodology that is used to test for interaction is markedly insensitive to several kinds of real interaction that would be of interest to psychologists, and the sample sizes required to search for interaction effects with adequate power are usually far greater than those commonly employed in research (Wahlsten, 1991, 1999a). Third, there is the question of the reality of interactions when environmental variations are modest and entirely normal.

In experiments combining two or more factors, the hypothesis of interaction is tested against the null hypothesis of an additive relationship. Statistical power of the test is the probability that the additive null will be rejected when there really is an interactive, nonadditive relationship. It has been shown that, for many kinds of interaction that might reasonably be expected in research on behavior, the power to detect an interaction is far lower than the power to detect the main effects of heredity in an analysis of variance (Wahlsten, 1990). The power of a statistical test depends strongly on the number of individuals observed in the study; more subjects yield greater power. It seems that researchers often employ too few subjects to make a test of interaction effects credible, and claims of no visible interaction are often based on wholly inadequate data.

The extent of the problem can be seen with a simple study where two strains of animals are reared in two environments. Suppose that the true group means are as in Figure 5.13. Both heredity and environment have important effects, but the effect of the environmental treatment on strain B is twice as large as the effect on strain A. Doubling a treatment effect is noteworthy and we would like to be able to detect this magnitude of interaction effect. If we set the probability of a Type I error (false positive) at 0.05 and want power to be 90%, the method of Wahlsten (1991, 1999a) reveals that the experimenter would be well advised to employ seven individuals per group if the only serious concern is the presence of main effects but would require 44 per group to be able to detect the interaction effect with the same degree of power. For this specific example, six times more subjects would be needed to detect a substantial interaction. Calculations of this kind should inspire us to ask when colleagues say they have searched for gene-environment interactions but could find none: What kind of interaction were you seeking and what was the power of the test? Did you use enough subjects to make the test credible?

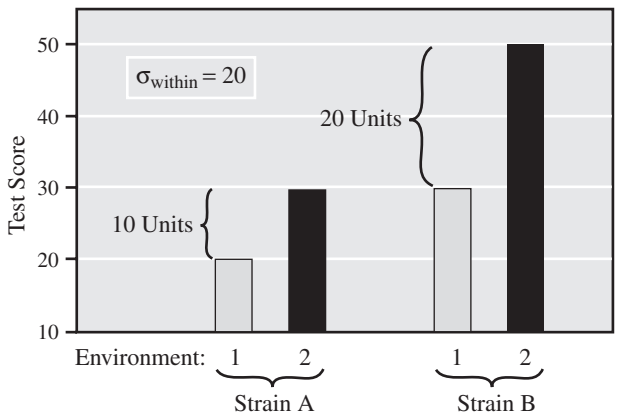


Figure 5.13 Example of heredity-environment interaction where two strains are reared in two environments. The environmental effect is 10 units for strain A but twice as large for strain B, such that the strains differ by 10 units in environment 1 but 20 units in environment 2. Relative to the standard deviation within a group (20 units), the environmental effect size is 0.5 for strain A and 1.0 for strain B. This is a substantial interaction that ought to be detectable in an experiment, and sample size should be chosen to confer adequate power on the test of the interaction effect. As explained in the text, the sample size needed to detect the interaction is about six times larger than the number of animals needed merely to detect the main effect of strain or environment at the same level of statistical power.

The question of interaction effects when environments are confined to the normal range has only been addressed recently in animal research. It is quite true that most studies in neural and behavioral genetics apply strong environmental treatments to substantially different genetic strains to maximize the likelihood of seeing real effects. Recent concerns about the replicability of experiments across laboratories have inspired systematic evaluations of the importance of everyday, ubiquitous variations in how we raise and test our animals in different labs. In these studies, serious efforts were made to minimize environmental differences. Crabbe, Wahlsten, and Dudek (1999) even implemented simultaneous shipping, breeding, and testing of animals in three labs. Nevertheless, strain differences on tests of open field activity and cocaine activation but not ethanol preference were significantly related to the lab where the experiment was conducted (see Wahlsten, Metten, Phillips, et al., 2003). One ineradicable difference among animal testing labs is the technician who administers the test, surely a mild environmental treatment but potentially important nonetheless. In an analysis of data on pain reactions in various strains of mice over a period of 8 years, Chesler, Wilson, Lariviere, Rodriguez-Zas, and Mogil (2002) found that the largest effect on pain sensitivity, larger than even the genetic effects, was indeed the technician giving the test!

Interactions do occur when environments differ only moderately but are unlikely to be detected statistically unless adequate samples are studied. Just as in the cosmos where dim objects require powerful telescopes to be perceived from Earth, statistically small effects in factorial designs demand larger samples to ensure they are visible above the level of unexplained, seemingly random variation within treatment groups.

The Hardware-Software Distinction

Additivity of effects of genes and environment presumes that the two things act separately in the process of development. A theory, often implicit but sometimes explicit, of how this might occur asserts that genes code for brain structure (the hardware) whereas experience stores information (software) in this inflexible matrix of prewired connections. The electronic computer thus serves as a convenient metaphor for the G + E formulation.

The hard-soft distinction originates in early theories of genetics and mental ability. Bateson (1913) held that Mendelian unit-characters or genes are the "fundamental elements, and consequences of environmental interferences are subordinate to them," and he claimed that nongenetic variability among individuals is "due to interference which is external." Spearman and Burt in psychology explicitly connected heredity with brain structure. Spearman (1904) asserted the existence of *natural innate faculties* and argued that "all such individual circumstances as after birth materially modify the investigated function are irrelevant and must be adequately eliminated" mathematically. Cyril Burt (1909) maintained of intelligence that "we may eventually seek the psycho-physical basis, underlying this capacity, in a particular characteristic of general neural constitution; the accentuation of such a neural characteristic would then produce the type of mind known as intelligent, while its biological inheritance would form the condition of the transmissibility of the mental trait" (p. 169). More recently, the ethologist Konrad Lorenz (1965) held that genes provide a "genetic blueprint" for the structure of the brain. The quantitative behavior geneticist Wilson (1983) wrote that "the brain is the ultimate structure underwriting human behavioral development" and its "precise wiring is coded in the DNA" (p. 10). The behavior geneticists Scarr and McCartney (1983) claimed that: "Maturational sequence is controlled primarily by the genetic program for development. In development, new adaptations or structures cannot arise out of experience per se" (p. 424).

The theory of a genetically hard-wired brain was proposed before the basis for neural connections and transmission was understood and prior to the emergence of modern neuroscience. The existence of neural plasticity in early ontogeny has been widely accepted for some time (Harris, 1981), but only in the past 2 decades has the notion of rigid adult brain structure been subjected to rigorous experimental tests. It is now well established that the synaptic connections in the cerebral cortex are substantially dependent on and altered by sensory and motor experience (Black & Greenough, 1998; Purves, 1994). According to Greenough, Black, Klintsova, Bates, and Weiler (1999), there is a multifaceted "brain adaptation" to experience even in mature individuals. New synapses can be added in mere hours while older, less active ones are eliminated (Kasai, Matsuzaki, Noguchi, Yasumatsu, & Nakahara, 2003). Synaptic turnover and changes in synaptic spine density are thought to be crucial for learning and memory (Rampon & Tsien, 2000). Gene expression arrays reveal that numerous genes related to "formation of new synapses and

reorganization or strengthening of existing synapses" are induced by even a few hours of enriched experience in mice (Rampon et al., 2000). Not just the synapses but even entire neurons are generated or eliminated in the brain as a function of early experience (Bredy, Grant, Champagne, & Meaney, 2003) and in the adult brain (Greenough, Cohen, & Juraska, 1999; Jessberger & Kempermann, 2003; Kempermann & Gage, 1999).

A rigid distinction between hardware and software may be essential for electronic computers, but this distinction does not fit with what is known about brain development and function. Experience alters brain structure. Genes do not code for brain structure or any other physical structure, but the actions of genes in response to events in their surroundings are crucial for the emergence of structures. At the same time, brain is not formless putty on which experience imposes structure arbitrarily. How a new experience alters the brain depends on the organism's heredity and the succession of prior experiences. Once the theorist concedes that genes and environment do not have separate actions in development, a credible theory of biologically additive effects is difficult to conjure.

Implications of the New Molecular Biology

Powerful new molecular techniques for the study of development have inspired some to proclaim that a scientific revolution is happening. Developmental psychology emerged and matured as a scientific discipline long before the era of molecular genetics. It is therefore important to assess whether modern molecular genetics challenges key developmental concepts and demands their revision. Our conclusion is that molecular biology confirms rather than negates ideas such as bidirectional causation and gene-environment interaction. Indeed, molecular investigations have now revealed in great detail the inner workings of interactions that previously were evident only at the level of the neural or behavioral phenotype.

The molecular revolution in biology has brought several major technologies to the experimenter's workbench:

- The sequence of nucleotide bases in the DNA of any organism can now be decoded readily, and the complete genome sequence has been ascertained for several species.
- The simultaneous expression of thousands of genes in mRNA can now be detected in small pieces of tissue from individuals of different ages under different environmental conditions.
- Knowing the DNA structure of any gene, special molecular probes can be used to disable it.
- Thousands of small and phenotypically neutral DNA polymorphisms have been identified that greatly facilitate the discovery of genetic variants that may be important for behavioral variation.

Taken together, these methods have revealed a staggering degree of complexity in living things. While many phenomena of limited scope have been beautifully illuminated with new techniques, the larger portrait of life remains unclear.

The Gene Tally

Intensive, expensive, and largely automated procedures have been devised to determine the DNA sequence of several organisms, including humans and mice that are central to concerns of developmental psychologists. Once the entire DNA sequence was determined, a vast cornucopia of new genes spilled onto the analyst's desktop in one surge. One profound complication to emerge from this work concerns the nature of the gene itself. Not too many years ago, it was widely assumed that knowledge of the DNA sequence would uncover all genes and the structure of each gene would specify the protein for which it codes, thereby telling us a great deal about its function. Now, we realize that the mRNA transcript from a gene can be spliced together and translated into more than one protein (Keller, 2000; Rose, 1998). It is also apparent that many other genes are intimately involved in regulatory processes but do not code for proteins as such. Furthermore, the vast majority (98%) of human and mouse DNA consists of noncoding DNA (introns) that does not specify protein at all; its function remains a mystery. These and other puzzling facts have generated uncertainty about precisely how many genes are embedded in the entire DNA sequence of a species. The initial estimate in February of 2001 for protein encoding genes in humans was 31,778, but this was scaled back to 22,808 by September of 2002. The 2001 tally indicated that more than half of the genes were entirely new to science at the time. In 2003, the best estimate was set at 24,500, but researchers "admitted they were nowhere near establishing a final count" (Pennisi, 2003) and cautioned that several thousand of these might be pseudogenes that look like a gene at the DNA level but

are silent and never become expressed in protein. Furthermore, an alternative and sophisticated approach to gene counting suggested the total could be as high as 45,000. In October of 2004, the International Human Genome Consortium (2004) reported progress on assembling the DNA sequence and conservatively set the likely number of protin-encoding genes at between 20,000 and 25,000. The history of assembling the human genome and the latest estimates are available at the Ensembl Human web site (http://www.ensembl.org/Homo_sapiens/index.html).

When the genome sequence of the laboratory mouse was completed (Mouse Genome Sequencing Consortium, 2002), there were 22,011 stretches of DNA that looked like a gene, but researchers cautioned that some genes "are missing, fragmented or otherwise incorrectly described, and some predicted genes are pseudogenes or are otherwise spurious." What was abundantly clear was the great similarity of the human and mouse genome resulting from homology or descent from a common ancestor. Fully 99% of mouse genes also exist in humans, and in many long regions of a chromosome, amounting to about 90% of the total genome, the linear order of genes seen in mouse is identical to the order evident in humans.

Mouse-human homology at the gene level provides strong support for the use of lab mice as experimental models of many human genetic disorders, but caution is warranted. The Mouse Genome Sequencing Consortium (2002) identified 687 mouse genes that were highly similar to human genes where mutant forms are known to be important for medical diseases. The surprise was in the fine details of the sequence for each gene. The specific form (allele) of a gene causing disease is usually rare in the human population because it reduces reproductive fitness, while the normal allele predominates. For several human genes where the sequence of the disease-producing allele has been determined, the normal allele in the mouse is the same as the mutant form in humans, yet the mice are healthy. These include familial Parkinson's disease, cystic fibrosis, Becker muscular dystrophy, and Crohn's disease. This finding demonstrates the importance of the developmental context of a gene. One species' genetic disaster may be another species' sustenance.

The vast number of genes is itself exceeded several fold by the rich diversity of proteins, which number in excess of 1 million kinds in humans (Anni & Israel, 2002). A gene in mammals typically consists of several exons whose DNA codes for the sequence of amino acids in a protein, and the exons are separated by long stretches of DNA called introns that do not code for amino acids. After the RNA is transcribed from the gene, the intronic portions are removed in the cell and the RNA from the exons is spliced together before being translated into a protein. This splicing can be done in several ways, however. In some cases, all the exons are represented in the sequence, but it often happens that one or more exons are not included in the final mRNA. By making use of various combinations of exons, the cell can generate more than a dozen functionally different proteins from just one gene.

In addition, each protein has the capacity to interact with other proteins. Many kinds of protein have been shown to interact significantly with five or more other proteins in *Drosophila,* resulting in a huge and intricate network of interactions (Giot et al., 2003). Although genes contain DNA that is relatively stable across generations, the proteins derived from genes do the major work of a cell or a system of cells, and development can be understood only by knowing how proteins function. Thus, comprehensive knowledge of genes should be regarded only as a preliminary step toward understanding the molecular biology of living things.

Gene Expression Arrays

Knowing the sequence of a gene, it is possible to synthesize a short, complementary sequence of DNA (cDNA) that will bind specifically to the mRNA that is produced from that one gene in a piece of tissue. A small dot of that cDNA can be deposited on a glass slide, and one slide can be made with several thousand dots, each of which can detect the quantitative level of expression of just one among the thousands of genes. The sample of highly expressed genes will include those known for decades as well as heretofore unknown genes. Thus, gene expression can be examined free from any preconceived notion of what a particular gene does (Lee et al., 2002).

Despite the exquisite sensitivity and specificity of this technique, the vast numbers of genes that are assessed simultaneously can, given our current crude understanding, yield only a picture with broad strokes. For example, data were combined for 553 microarray experiments on the nematode worm *C. elegans* to study the expression of more than 11,000 genes under several conditions and at different ages to identify clusters of genes that had similar expression profiles (Kim et al., 2001). Researchers termed the 44 visible clusters *mountains* on the gene expression landscape because

they could be seen as high points in a three dimensional plot. Mountain number 6 contained 909 genes whose mRNA levels were correlated with each other at a median Pearson $r = .21$, and many were especially active in neural tissue.

The genome-wide assessment of expression has provided overwhelming evidence that environmental conditions alter the activity of very large numbers of genes. For example, the circadian light-dark cycle entrains a 24-hour expression pattern for about 10% of all genes expressed in a particular tissue in mice, amounting to 1,000 or more genes, but the set of genes that fluctuate most widely with time of day depends on the specific tissue (Storch et al., 2002). It is also apparent that some genes are regulated to a greater degree than others in response to environmental change (Lee et al., 2002).

Given the large numbers of genes (more than 10,000) being assessed in one experiment with arrays, the risks of detecting false positive relationships are substantial and criteria for claiming a real change in expression tend to be somewhat arbitrary. Other difficulties in interpreting these experiments exist (Nisenbaum, 2002), and it is prudent to exercise caution at this early stage of the investigations. By far the biggest problem with gene arrays is that, at present, the results using different systems from different manufacturers show little overlap, so data from different studies are difficult, if not impossible, to compare (Marshall, 2004). The magnitude of the problem is suggested by the fact that, in 2003 alone, there were approximately 3,000 published microarray studies (Marshall, 2004).

Targeted Mutations

When the DNA sequence of a gene is well documented, this knowledge can be used to construct a molecular probe that will insert a fragment of foreign DNA at a targeted location in the specific gene of interest to the investigator. This is a transgenic method because it transfers DNA from one species to another. When the insertion event is transmissible to progeny, the new mutation is an allele at the genetic locus. Targeted mutations have been created in hundreds of genes in mice to generate allelic diversity at loci where previously only the normal, "wild type" allele had been known (Müller, 1999; www.informatics.jax.org). In many instances the allele is termed a *null mutation* or *knockout* because it completely abolishes the capacity to synthesize protein that normally depends on that gene. The mouse has special importance in this realm because targeted mutations generally cannot be done in humans for ethical reasons and the mouse is very similar genetically to humans.

A method with many steps usually poses difficulties of interpretation and requires elaborate controls for extraneous variables. A knockout effect cannot be conclusively attributed to a specific gene without the use of additional breeding experiments to prove that another, nearby gene was not involved (Gerlai, 1996). Although these experiments are not overly complicated (Crusio, 2004; Wolfer, Crusio, & Lipp, 2002), they do take time and are sometimes neglected in the rush to publish exciting findings.

One of the great surprises from knockout research is that the animal may be viable and even relatively healthy despite the total loss of function of what was believed to be an essential gene. For example, a knockout of the *dopamine-ß-hydroxylase* gene in mice creates an animal that is completely unable to synthesize norepinephrine, a key neurotransmitter and neurohormone that is featured prominently in neuroscience texts. If these mice are helped to survive the difficult period from the late fetus until weaning, many of them are able to survive as adults and negotiate mazes with only minor deficits (Thomas & Palmiter, 1997). Frustrated researchers have in some cases made a heroic but futile search for a dramatically altered phenotype after knocking out a gene. These results do not show that the gene is functionally irrelevant. Instead, they indicate a considerable degree of flexibility in the developmental system, whereby other mechanisms can compensate for the loss of one of the parts.

Knockout research in mice has generally focused on one or a few genes of specific interest to the investigator, but the method has the potential to yield information on all genes in the genome. Researchers have created mutations in almost every gene of the single-celled yeast organism *Saccharomyces cerevisiae* (Giaever et al., 2002). Others were able to insert DNA fragments into more than 21,000 of the 29,454 genes of the plant *Arabidopsis thaliana* (Alonso et al., 2003). The technology exists to perform a similar feat with mice, but the prospect of breeding and maintaining more than 20,000 mutants to assess behavioral function is not appealing.

Molecular Markers

To detect the presence of a mutant gene that may be important for individual differences in a population, one can show that variations in some phenotype tend to be transmitted from parent to offspring in close association with

DNA markers that themselves do not alter the phenotype (Crabbe, 2002). The closer the marker is to some unknown gene on the same chromosome, the more likely the two will be transmitted together because they are genetically "linked." Prior to the era of molecular genetics, linkage analysis was often inconclusive or insensitive because there were so few markers available for research. The situation changed dramatically with the discovery of thousands of polymorphic loci spread widely across the chromosomes where there happened to be long and senseless repetitions of the nucleotide bases adenine and thymine (AT repeats). These markers are generally located in the noncoding DNA and therefore have no effect on phenotypes, and they undergo mutations at unusually high rates, such that differences often occur between even closely related individuals. Even more common are loci where there is a difference at a single nucleotide in the population. Technology now exists to detect these single nucleotide polymorphisms (SNPs or "snips") with relative ease, and the specific DNA sequences for thousands of SNPs are known in humans and mice. The most recent update of the dbSNP database (build 122 at http://www.ncbi.nlm.nih.gov/SNP) indicates that a whopping 235,026 SNPs are now well documented for humans and 544,636 for mice. These variants have made it much easier to detect a gene with major effects on development and localize it to a short segment of a chromosome.

A recent study by Edenberg et al. (2004) illustrates the power of the new molecular tools. The team assessed alcoholism and electroencephalogram (EEG) brain waves in families with several alcoholics as well as nonalcoholics. Earlier evidence had indicated the involvement of a receptor for the inhibitory neurotransmitter molecule GABA (gamma-amino butyric acid), but there were four GABA receptors in a cluster on chromosome 4. The existence of several dozen SNPs in this region of chromosome 4 was indicated by the public databases of human genes, especially the dbSNP site, and the researchers found that variation in clinical diagnosis and EEG was strongly associated with SNP genotype in the GABRA2 gene but not the other three nearby genes. Finally, they sequenced the DNA in the GABRA2 gene in 48 individuals and found that the nucleotide polymorphisms did not alter the amino acids in the GABA receptor molecule. Instead, they concluded that the polymorphism pertinent to alcoholism is located in a region of the gene that is important for the regulation of gene action.

It is now believed that many genetic variants involved in complex human disorders do not alter the structure of the protein encoded by a gene but instead influence the binding of regulatory molecules to regions of the gene that turn transcription on and off during development. This possibility should be regarded as hypothesis until the specific regulatory mechanism is identified for any particular gene, but it is a credible hypothesis. For many other genes cited in the psychiatric literature, the data demonstrate only that a marker locus is correlated with phenotypic diversity and that the marker is close to some gene of importance in nervous system and behavioral function. In many cases, the actual gene responsible for phenotypic variation is not known. It is quite possible that a marker locus is located in an intron of one gene but the exons of that gene do not produce individual differences, while that gene is close to another gene on the same chromosome that happens to be the source of the phenotypic variation. To interpret this research literature properly, one must read the fine print carefully and have a substantial knowledge of molecular genetics.

The allure of the new biotechnologies is great, and their achievements are impressive indeed. What they have not done, however, is provide ready answers to questions posed by developmental psychology at the level of nervous system and behavior. On the contrary, the behavioral development of transgenic and knockout mice has rarely been examined (Branchi & Ricceri, 2002). Reductionism expects that phenomena at the more macroscopic levels of reality can be explained best by reference to events at the molecular level; consequently, a reductionist language has evolved among many molecular biologists that relegate environmental factors to subordinate clauses, consistent with Bateson's (1913) view of the primacy of the gene. To a developmentalist, the abundant new information about molecular gene activity has not dispensed with the need to understand principles at the level of the behaving organism. Instead, it has opened a portal into a world of stunning molecular complexity.

APPLICATION OF A DEVELOPMENTAL PSYCHOBIOLOGICAL SYSTEMS VIEW: THE CASE OF INTERSENSORY DEVELOPMENT

As the two previous sections of this chapter have made clear, there is a growing appreciation of the value of grounding the study of human development in a system

of multiple influences, rather than continuing to utilize simpleminded explanatory dichotomies such as genes or environment, instinct or learning, maturation or experience, and structure or function. It seems to us that an emphasis on the various ontogenetic processes involved in the emergence of phenotypic outcomes effectively eliminates these explanatorily empty dichotomies. In their place, a developmental psychobiological systems approach provides a more comprehensive view of development—a view that attempts to integrate genetic, neural, behavioral, social, and cultural levels of analysis (see Figure 5.6). This integrative effort is in keeping with the vision of the pioneering developmentalist Z.-Y. Kuo (1967), who wrote 4 decades ago: *"The study of behavior is a synthetic science.* It includes comparative anatomy, comparative embryology, comparative physiology, experimental morphology, and qualitative and quantitative analysis of the dynamic relationship between the organism and the external physical and social environment" (p. 25).

Kuo's interdisciplinary, multilevel vision for the developmental analysis of behavior is gradually being incorporated into developmental science (Lickliter, 2000b). This is seen in the increasing shift away from simple cause-and-effect models of development that rely on predeterminism, linearity, or reductionism, and the move toward more dynamic, hierarchical, systems-oriented approaches to development. This developmental systems approach has become increasingly evident in several subareas within developmental psychology in recent years including the study of motor development (Thelen, Schöener, Scheier, & Smith, 2001; Thelen & Ulrich, 1991), cognitive development (Bjorklund, 1995; Richardson, 1998), language development (Dent, 1990; Zukow-Goldring, 1997), personality and emotional development (Lerner, 1988; Lewis & Granic, 2000), and social development (Cairns et al., 1990; Fogel, 1993) to cite but a few examples.

The conceptual and methodological shift to a more systems-oriented approach is also increasingly evident in the study of perceptual development (Gottlieb, 1991, 1997), and, especially, the study of early intersensory capabilities. Our environment is inherently multimodal, with objects and events typically experienced through several sensory systems simultaneously. How the individual sensory modalities relate to one another and how their functions are integrated in the brain has been of growing concern to a variety of investigators working in developmental psychology (Bahrick & Lickliter, 2002; Lewkowicz & Lickliter, 1994; Rose & Ruff, 1987), developmental biology (Edelman, 1987, 1992), cognitive science (Bertelson & de Gelder, 2004; Smith & Katz, 1996), and the neurosciences (Calvert, Spence, & Stein, 2004; Stein & Meredith, 1993). Recent empirical and conceptual advances in these related fields have served to guide a growing number of investigators away from simple, single-cause explanations and toward an increasing appreciation of the multiple influences, at various levels of analysis, that contribute to the emergence of intersensory integration.

What follows here is not intended as a comprehensive review of these burgeoning areas of research; rather, it is a brief examination of traditional and emerging conceptual and operational frameworks associated with this area of investigation. The principal goal is to explore how the application of a biologically plausible developmental systems perspective can provide students of perceptual development with a framework that both acknowledges the complex and dynamic nature of development and attempts to integrate developmental data from genetics, neuroscience, and psychology into a coherent and complementary account of how young organisms come to integrate distinct sensory inputs in a coordinated way that allows for a unitary perception of objects and events. Intersensory integration is a fundamental characteristic of normal perception, and to successfully answer the question of "how" it is achieved over the course of development requires an interdisciplinary, multilevel, comparative approach to developmental analysis, as advocated by Kuo (1967) and, more recently, by Gottlieb (1991, 1996, 1997).

Traditional Approaches to Intersensory Development

During the past several decades, there has been substantial research on the intermodal capabilities of human infants (Aslin & Smith, 1988; Bahrick, Lickliter, & Flom, 2004; Lewkowicz, 2000; Lewkowicz & Lickliter, 1994; Meltzoff, 1990; Rose & Ruff, 1987). In a general sense, this research has been largely descriptive in nature and has been directed at establishing the timing of the emergence of various perceptual competencies over the course of the 1st year following birth. This work has successfully documented that young infants display a large and diverse repertoire of intersensory abilities, including the ability to match faces and voices on the basis of voice-lip synchrony (Dodd, 1979), speech sounds

(Kuhl & Meltzoff, 1984), affective expressions (Walker-Andrews, 1997), and gender of the speaker (Walker-Andrews, Bahrick, Raglioni, & Diaz, 1991). Infants have also been shown to be sensitive to a number of temporal parameters unifying auditory and visual stimulation, including synchrony (Bahrick, 1987, Lewkowicz, 2000; Spelke, 1981), rate (Lewkowicz, 1985; Spelke, 1979), rhythm (Bahrick & Lickliter, 2000; Mendelson & Ferland, 1982), and duration (Lewkowicz, 1986). Related work has also demonstrated impressive haptic-visual connections present over the course of the 1st year, including tactile discrimination and cross-modal transfer abilities within the first months of postnatal life (Bushnell, 1982; Clifton, Rochat, Robin, & Berthier, 1994; Rochat & Senders, 1991; Rose, 1994; Streri & Molina, 1994).

Despite these varied and impressive demonstrations of infants' intersensory capabilities, there has been surprisingly limited concern in this body of work for the various possible contributions of prior prenatal and postnatal experience (see Figure 5.7), or with the specific processes and mechanisms whereby intersensory functioning is achieved and modified during early development. This state of affairs is no doubt due in large part to the inherent experimental limitations of working with human infants. Experiential manipulations of human fetuses and neonates are necessarily limited in scope and duration, and traditional experimental techniques such as sensory deprivation or sensory augmentation are prohibited. Experimental limitations aside, we believe the general lack of focus on the processes and mechanisms associated with human intersensory development is also the result of the types of questions that have typically been pursued in this area of research.

Perhaps the most prominent question guiding research in the area of infant intersensory development over the past 30 years is a question concerned with direction: Does intersensory development proceed (a) from initially separate senses to coordinated multimodal experience or (b) from an initial unity of the senses to differentiated modalities? The pursuit of answers to this question has resulted in two prevailing (and opposing) theoretical views, known respectively as the "integration view" and the "differentiation view" of intersensory development (see Bahrick & Pickens, 1994; E. J. Gibson & Pick, 2000, for brief reviews).

In a general sense, the integration view holds that the different sensory modalities function as separate sensory systems during the initial stages of postnatal development and become integrated and coordinated during development through the infant's activity and resulting repeated experience with concurrent information provided by the different modalities (Birch & Lefford, 1963, 1967; Friedes, 1974; Piaget, 1952). For example, Piaget argued that as infants manipulate objects in their environment, they have multiple opportunities to experience the tactile, auditory, visual, and gustatory properties of these objects. It is hypothesized that, through these repeated experiences, infants gradually come to successfully associate their various multimodal sensations. In contrast, the differentiation view of intersensory development holds that the different senses form a primitive unity early in development, and, as the infant develops, information arising from the different sensory modalities is differentiated (Bahrick, 2000; E. J. Gibson, 1969; J. J. Gibson, 1966; Marks, 1978). Thus, E. J. Gibson (1969) has argued that infants possess some intersensory capabilities at birth and are innately able to perceive properties of objects or events that are amodal or invariant across sense modalities (e.g., intensity, duration, rhythm, shape). From this perspective, infants are thought to differentiate finer and more complex multimodal relations through their experience over the course of development. Detection of intermodal invariants is central to this view, and the differentiation and extraction of progressively finer levels of invariant structure is considered to be the main developmental task of the infant (Bahrick, 2000).

Assumptions Underlying Traditional Approaches

The enduring debate between the integration and differentiation views has certainly provided a heuristic for directing much of the empirical work concerned with early intersensory functioning in human infants over the past several decades. Both perspectives have, however, relied on several common underlying assumptions that are now questionable in light of our increasing knowledge within neuroembryology and developmental psychobiology. In particular, several of the usually implicit assumptions common to both integration and differentiation theories fail to adequately recognize the complex and dynamic processes of organization and reorganization occurring within (Freeman, 1991; Kellman & Arterberry, 1998) and between (Honeycutt & Lickliter, 2003; Radell & Gottlieb, 1992; Symons & Tees, 1990) sensory systems over the course of both prenatal and postnatal development. This has tended to result in an

overly simplistic and essentially nondevelopmental characterization of the sensory modalities and their emerging sensitivities on the part of both the integration and the differentiation views. For example, an implicit assumption of both viewpoints has been that the sensory systems start out on an essentially equal basis (R. L. Tees & Buhrmann, 1989). This assumption is in contrast to what is known about the neuroembryological development of the sensory systems. The various sensory modalities of birds and mammals (including humans) do not become functional at the same time in development (Alberts, 1984; Bradley & Mistretta, 1975; Gottlieb, 1971b); as a result, the various sensory modalities have different developmental histories during the prenatal and postnatal periods. These experiential differences can significantly affect the ability of a particular modality to process a given type of sensory input at a given point in early development (Gottlieb, 1971b; Lickliter, 1993; Turkewitz & Kenny, 1982).

As a case in point, in humans (and many precocial birds and mammals), the auditory modality becomes functional at some time during the late stages of the prenatal period, whereas the visual modality has its functional onset at birth. A number of recent studies utilizing avian and mammalian embryos and infants have demonstrated that the sequential heterochronic emergence of function in the various sensory systems can have an important influence in determining the nature and modification of intersensory relationships during early development (Foreman & Altaha, 1991; Foushee & Lickliter, 2002; Gottlieb, Tomlinson, & Radell, 1989; Kenny & Turkewitz, 1986; Lickliter, 1990; Symons & Tees, 1990). For example, the auditory modality has been shown to have functional priority over the later developing visual system during the early stages of the postnatal period in several precocial animal infants (Gottlieb & Simner, 1969; Johnston & Gottlieb, 1981; Shillito, 1975). This early sensory dominance hierarchy is due in part to the fact that, at the time of birth, these two sensory systems have had different amounts of prenatal experience (Lickliter, 1994). Neither the integration view nor the differentiation view has typically considered the possible influences of such timing or asynchronicity issues in their accounts of intersensory capacity (but see Mellon, Kraemer, & Spear, 1991; Spear, Kraemer, Molina, & Smoller, 1988). The result has been a general lack of appreciation of the role of functional constraints or limitations in the realization of early patterns of perceptual organization (but see Lickliter, 2000a; Turkewitz & Kenny, 1982; Turkewitz & Mellon, 1989). Because of the sequential onset of function among the various sensory modalities, each sensory system has a unique developmental history by the time of birth. Alterations of typical patterns of sensory stimulation may have significant effects on perceptual organization and responsiveness.

The integration and differentiation views have also tended to ignore or downplay the fact that the sensory modalities are somewhat specialized for the processing of different kinds of perceptual information. For instance, the auditory modality is known to be relatively more effective at processing temporal rather than spatial changes; in contrast, the visual modality is relatively more effective at processing spatial rather than temporal changes (Kubovy, 1988; Welch & Warren, 1986). The different senses are not simply equivalent ways of perceiving objects or events; they can differ in both the precision and rapidity of their responsiveness to different perceptual information (Bushnell & Boudreau, 1993; Soto-Faraco, Spence, Lloyd, & Kingstone, 2004). Differential salience rankings inherent in specific kinds of perceptual information can result in some object or event properties (e.g., temperature, texture, size, weight, temporal frequency, spatial motion) being apprehended more quickly or appropriately in one sensory modality than in others. These salience rankings of various stimulus properties are not likely to be the same in any two modalities (Bushnell, 1994), nor are they likely to change within or across modalities in uniform or equivalent ways over the course of development. For example, Lewkowicz (1988) has shown that, in human infants, the relative dominance of concurrent auditory and visual inputs can be reversed. Thus, the common assumption that responses to amodal properties can be assessed or discussed without reference to the particular properties included, and their relative salience within and across modalities, is overly simplistic. The infant's ability to integrate or differentiate information across the various sensory modalities is likely influenced by the relative salience ranking of different sensory inputs (Bushnell, Shaw, & Strauss, 1985; see also Spear & Molina, 1987).

How such salience factors and their influences are realized and how they change over early development remain poorly understood and have rarely been considered by either integration or differentiation views. This has contributed to an enduring underappreciation of the task-specific and context-sensitive nature of developing intersensory capabilities in much of the work derived from these opposing views.

Perhaps most important, integration and differentiation theories of intersensory development have generally assumed that intersensory functioning is a unitary phenomenon that can be characterized by a single developmental pathway. However, as noted by Ryan as long ago as 1940, and as echoed more recently by Turkewitz and his colleagues (Botuck & Turkewitz, 1990; Turkewitz & Mellon, 1989), there are a number of different types or categories of intersensory functioning, including intersensory inhibition and facilitation, association of multimodal characteristics (multimodal coordination), and abstraction of common information (intersensory equivalence). There is no reason to necessarily assume that these different instances of intersensory functioning share common developmental mechanisms or pathways. Indeed, each distinct type of intersensory functioning may have its own developmental trajectory and be influenced by different neural, physiological, psychological, and social mechanisms. In this light, Turkewitz and Mellon (1989) argue:

> It is therefore possible for intersensory equivalence to be both present and absent at birth, for the senses to be simultaneously unified and separate, and for development to proceed by both differentiation and integration. That is, development may be characterized not by the presence or absence of intersensory functioning at various stages, but by the prevalence or conspicuousness of different types of intersensory functioning at different stages of development. (p. 289)

The insight that intersensory perception is not a unitary process (Lewkowicz, 2002; Turkewitz, 1994; Walker-Andrews, 1994) is not yet widely appreciated, despite growing evidence to indicate that diverse intraorganismic and extraorganismic factors can interact probabilistically to determine whether information to the different sensory modalities will or will not be integrated. Besides the factors briefly reviewed above (i.e., the changing functional properties of the sensory systems, the differential salience hierarchies of the various modalities, and the processes of differentiation and integration), nonspecific stimulus characteristics such as the relative intensity or amount of stimulation presented to the various modalities (Lewkowicz & Turkewitz, 1980; Lickliter & Lewkowicz, 1995; Radell & Gottlieb, 1992), and specific organismic characteristics such as the state of arousal of the infant (Gardner & Karmel, 1984; Gottlieb, 1993; Reynolds & Lickliter, 2004) have been shown to contribute to the infant's emerging capacity for specific intersensory functions.

Thus, individual intersensory functioning is multidetermined, with diverse internal and external variables interacting, often in a nonlinear fashion. As pointed out by Thelen and Smith (1994), moving and perceiving provides infants with varied, multimodal "takes" on how the world looks, feels, sounds, tastes, and smells. These experiences of hearing and seeing and touching and moving are all time-locked and are known to change together as the infant's activity, state, and actions change. What is needed to more fully unpack and assess these varied factors and their interactions is a developmental systems view that approaches the study of intersensory development at a suitable level of complexity that does justice to these varied influences and provides a biologically plausible, yet conceptually nonreductionistic, account of the development of intersensory functioning. Steps are being made in this direction.

Developmental Psychobiological Systems Approach to Intersensory Development

Recently, there has been increasing appreciation of the need to move beyond descriptive studies and toward the experimental examination of the various sensory and nonsensory factors that contribute to the emergence of infants' intersensory functioning (Bahrick & Lickliter, 2002; Lewkowicz, 2002; Lewkowicz & Lickliter, 1994; see Turkewitz, 1994 for an alternative view). As suggested earlier, this shift in focus from "what" and "when" questions to "how" questions is requiring investigators to reconsider and even revamp several of the traditional conceptual and methodological approaches that have been employed in the study of early perceptual organization. The larger goal of this reorientation is to understand and explain individual functioning and its organization without denying the complexity of the phenomena to be understood.

In our view, such a change in focus will best be served by adopting research strategies that are explicitly interdisciplinary in nature and that place strong emphasis on comparative developmental studies (Lickliter & Bahrick, 2000). In other words, an empirical concern with the complexity of the processes and mechanisms underlying intersensory development will profit from information obtained from a variety of analytical levels and drawn from a variety of animal species. Given that the development of any specific behavioral capacity is the product of dynamic, bidirectional interaction among multiple, hierarchically organized levels (see Figure 5.6), we believe that the utilization of interdisciplinary,

comparative, and convergent research strategies is essential to discovering and defining the various conditions, experiences, and events (both internal and external to the organism) necessary and sufficient to understand normal perceptual development.

As discussed earlier, Gottlieb (1991, 1992) has distinguished three functional organismic levels (genetic, neural, and behavioral) and three environmental levels (physical, social, and cultural) of analysis central to a developmental psychobiological systems approach (Figure 5.6). The complex network of interdependent bidirectional relationships among gene action, neuroanatomy and physiology, behavior, and social influences clearly poses a challenge for those who still hope to identify simple unidirectional linkages between levels of organization. This complexity also poses a challenge for researchers committed to unraveling the intricate web of nested influences involved in early development, but for different reasons. Such a complex network requires the discovery of dynamic, bidirectional relationships rather than single antecedent-consequent linkages. Despite this challenge, some initial progress is being made in this regard. Although the genetic and cultural levels of Gottlieb's psychobiological systems framework remain relatively unexplored in the study of early intersensory capabilities, several researchers have taken first steps toward attempting to integrate neural and behavioral levels of analysis (e.g., Knudsen & Brainard, 1991; Knudsen & Knudsen, 1989; Stein & Meredith, 1990; Stein, Meredith, Huneycutt, & McDade, 1989; R. L. Tees, 1994) and the physical and social levels of analysis (Columbus & Lickliter, 1998; Gottlieb, 1993; Lickliter & Gottlieb, 1985, 1988; McBride & Lickliter, 1993). These initial efforts at multilevel analysis are all comparative studies and have employed a variety of avian and mammalian subjects.

Operationally, these varied experiments have manipulated the sensory experiences of developing animals and produced systematic changes in neural and/or behavioral responsiveness to multimodal information. For example, Knudsen (1983) raised developing barn owls with one ear plugged, changing the relative timing and intensity of inputs to the two ears and altering the relative weights of the binaural cues used to construct the bird's auditory receptive fields (e.g., auditory map) in the optic tectum, the brain region involved in the localization of sensory events. Despite the fact that these ear-occluded birds had to learn to function on the basis of abnormal binaural cues, they nonetheless developed an auditory map in surprisingly good register with their visual map (Knudsen, 1983). However, when the ear plug was removed after the owls became adults, the input from the previously deprived ear was far stronger than it was when the auditory map was first formed, resulting in misaligned auditory and visual spatiotopic maps. Correction of this misalignment induced by the onset of normal auditory experience was found to be dependent on the availability and use of visual spatial cues. If no visual information was provided (i.e., the owl was reared in the dark), no corrective reorganization was observed (Knudsen, 1985).

King, Hutchings, Moore, and Blackmore (1988) found similar activity-dependent neural and developmental processes in young ferrets. These mammals had either one ear occluded or one eye deviated during early development. In both cases, a shift in the animal's auditory receptive fields was found to be a result of the experimental sensory modification. This functional shift or compensation ensured the successful alignment of the ferret's auditory and visual inputs, despite ongoing experimental modification of either auditory or visual input. Such findings also illustrate how one sensory system's receptive fields or map (the visual) can exert critical developmental influences on the induction and maintenance of another modality's (the auditory) spatiotopic neural map. Presumably, under normally occurring conditions, map alignment reflects ongoing experience with auditory and visual stimuli that are concurrently produced by the same object or event and are thus linked in time and space (Stein & Meredith, 1993). The similarity of the results obtained with owls and ferrets demonstrate how altered sensory experience can drive neural change and how neural change can, in turn, drive behavioral change. These two processes work in a reciprocal, interdependent fashion, again illustrating the bidirectional theme promoted throughout this chapter.

Working at the physical and social levels of analysis, several related studies utilizing precocial birds have demonstrated that social interaction with conspecifics can facilitate the often rapid perceptual reorganization required during early development (see Lickliter, Dyer, & McBride, 1993, for a review). In addition to providing nurturance and protection to the developing organism, the social environment provides an array of perceptual experience, including thermal, tactile, olfactory, auditory, and visual stimulation. Conspecifics can thus be viewed as experiential resources to the developing individual and have been found to play a significant role in the development of species-typical perceptual organization. For example, Lickliter and Gottlieb (1985) found

that young ducklings require physically interactive social experience with siblings to exhibit a species-specific visual preference for a familiar maternal hen over an unfamiliar hen of another species. Young birds that were able to see siblings but were denied physical contact with those siblings in the period following hatching failed to show species-typical visual preferences (McBride & Lickliter, 1993).

The importance of tactile contact with siblings for the development of ducklings' normal auditory learning ability was also demonstrated by Gottlieb (1993), who found that physical interaction with siblings induces such a high degree of malleability in young ducklings that they are able to learn to prefer nonconspecific maternal calls, an ability not present in ducklings who could see and hear but not physically interact with siblings. Lickliter and Lewkowicz (1995) also showed the importance of prenatal tactile and vestibular stimulation from broodmates for the successful emergence of species-typical auditory and visual responsiveness in bobwhite quail chicks. Taken together, these studies of precocial birds (a) provide varied examples of the often nonobvious and multilevel influences contributing to the emergence of normal perceptual organization, (b) remind investigators of the need to be open-minded when attempting to identify the experiences that influence a given perceptual capability, and (c) underscore the often critical role of social processes to psychobiological development. This insight is often overlooked, in that the contribution of the social experiences of human infants has been disregarded in most laboratory studies of intersensory integration.

System Characteristics of Intersensory Development: Structured Organisms and Structured Environments

A synthesis of the findings of various comparative studies from the neural, behavioral, and social levels of analysis suggests several interrelated defining characteristics of intersensory development. Intersensory development is:

- *Multidimensional:* No level, component, or subsystem (including those internal to the infant) necessarily has causal priority in the developmental system.
- *Nonlinear:* The intricacy of developmental causal networks is not always obvious or straightforward; to be identified, the networks require repeated probes at more than one level of analysis.
- *Activity dependent:* Intersensory abilities emerge from the infant's ongoing activities and encounters with the world.
- *Context sensitive:* Emerging intersensory capacities can be strongly influenced or modified by specific features of the infant's immediate surroundings.
- *Task specific:* Local variability can facilitate or interfere with the infant's intersensory performance.

Several of these related characteristics of intersensory development have begun to be acknowledged in work with human infants (in particular, with respect to context-sensitive and task-specific properties; see Bahrick et al., 2004; Lewkowicz, 2002; Streri & Molina, 1994). Few investigators, however, have attempted to combine the cross-disciplinary connections and comparative perspectives that would highlight the social, multidimensional, and nonlinear nature of intersensory development. It is unfortunate that insights from a comparative approach to intersensory functioning continue to be largely ignored in much of contemporary developmental psychology. Nonhuman animal findings can provide potentially useful and productive guidelines for directing the "how" questions about human development (Gottlieb & Lickliter, 2004). For example, experiential modification studies employing sensory deprivation or sensory augmentation, either prenatally or postnatally, have recently yielded important information regarding the experiential conditions necessary for the normal development of intersensory organization in both altricial and precocial neonates (Banker & Lickliter, 1993; Foreman & Altaha, 1991; Gottlieb, 1971b; Gottlieb et al., 1989; Kenny & Turkewitz, 1986; R. C. Tees & Symons, 1987). However, these findings have rarely been utilized in directing investigations of human functioning (but see Bahrick & Lickliter, 2002; Eilers et al., 1993; Lewkowicz, 1988; Wilmington, Gray, & Jahrsdoerfer, 1994).

The continued resistance to incorporating results from the comparative approach into mainstream developmental psychology, and the resulting underappreciation of the principles of multidimensionality and nonlinearity, perpetuate a reductionistic view of the underlying causes of behavior. Many students of human development continue to take for granted that behavior is somehow based on or determined by more "fundamental" or "primary" processes that occur at the genetic and/or neurophysiological level. This linear, unidirectional, bottom-up view of the "biological bases" of behavior—and the privileged status it typically credits to

genetic and neurophysiological components of human functioning—is conceptually flawed, despite its widespread use. Specifically, this bottom-up view of development overlooks the fact that genetic or neural factors are always part-and-parcel of the individual organism's entire developmental system (Gottlieb & Halpern, 2002; Johnston & Gottlieb, 1990; Lickliter & Berry, 1990; Oyama, 1985). No single element or level in the system necessarily has causal primacy or privilege, and the functional significance of genes, neural structures, or any other influence on phenotypic development can be understood only in relation to the developmental system of which they are a part (see Figure 5.6). At each level of the developmental system, the effect of any level of influence is dependent on the rest of the system, making all factors potentially interdependent and mutually constraining (Gottlieb, 1991). Although this relational emphasis makes for complexity, such complexity is not hopeless and can be experimentally unraveled at all four levels of analysis depicted in Figure 5.6 (see review by Gottlieb, 1996).

The important idea that control for any developmental outcome resides in the structure and nature of the relationships within and between internal and external variables (rather than in any individual factor) is not yet widely appreciated in developmental psychology. Nonetheless, we believe this insight from the developmental psychobiological systems approach has important implications for the study of behavioral development. In particular, the notions of diffuse control and reciprocal interaction highlight the need for an explicit empirical concern with the dynamic relationship between the developing organism and its structured environment. From this perspective, it is no longer plausible to attempt to reduce this complex, dynamic relationship to strictly or solely genetic or neural levels of analysis. The minimum unit for developmental analysis must be the developmental system, comprised of both the organism and the set of physical, biological, and social factors with which it interacts over the course of development.

Recognition of the need for an empirical concern with the relationship between the organism and its environment has been evident in the work of several prominent students of perception over the past 50 years (e.g., Brunswik, 1952, 1956; J. J. Gibson, 1966, 1979). These authors argued that to construct psychological theories at an adequate level of complexity, it would be necessary to study representative samples of both subjects and their situations. The relation between the organism and its environment, rather than the nature of the organism itself, was viewed as the appropriate object of study for psychology. For example, J. J. Gibson (1966, 1979) advocated an ecological approach to the study of perception in which the researcher would be explicitly concerned with the structure of the environment, how the organism moves about in it, and what sorts of perceptual information the environment provides to the perceiving organism. From this approach, perception depends on the kinds of experiences that come from having a body with various sensory and motor capacities that are themselves embedded in a more encompassing physical, biological, psychological, and social context (Thelen et al., 2001; Varela, Thompson, & Rosch, 1991). Developmentalists are thus faced with the challenge of determining both how the environment of the fetus or infant contributes to and constrains the perceptual information available to the young organism and how these contributions and constraints are themselves specified by the changing sensorimotor structure and capacities of the developing organism (see Adolph, Eppler, & Gibson, 1993; Lickliter, 1995; Ronca, Lamkin, & Alberts, 1993). For example, Bertenthal and Campos (1990) found that infants' perceptual responsiveness to objects and surfaces can change significantly following some experience with crawling. As new actions become available to the maturing infant, new opportunities for exploring the environment also emerge. This bidirectional approach stresses the fundamental connectedness of the organism to its surroundings and recognizes that empirical investigation beyond the boundaries of the organism is essential to a full understanding of the organism and its behavior.

Ironically, this approach is sometimes viewed as being "environmentalist" in orientation and thus in opposition to a "biological" approach to the study of human development. This dichotomous view derives from an implicit developmental dualism, still common in some quarters of developmental psychology, that attempts to delineate between the relative causal power of internal versus external factors thought to be associated with any given behavioral trait or ability. This dualism and its excessive reductionism are explicitly rejected by the developmental psychobiological systems view advocated in this chapter. We believe that a hard-line distinction between genetic and environmental causation, between internal and external sources of

control, between nature and nurture, is no longer tenable in developmental science. As a case in point, the multilevel, nonlinear, and activity-dependent processes revealed in comparative work on intersensory development are not adequately captured by the traditional dichotomy of internal versus external causation that is still common in much of developmental psychology. What is needed is an approach to intersensory development in which factors within and outside the organism are studied in explicitly relational terms (Gottlieb & Halpern, 2002).

The need for this relational approach is perhaps best illustrated by the notion of "effective" stimulation, an idea originally put forth by the comparative psychologist T. C. Schneirla (1959, 1965). In brief, the idea of effective stimulation holds that the effectiveness of a particular stimulus depends not only on its specific quantitative (physical) value, but also on the properties of the organism's receptors, the organism's general state of arousal, the organism's experiential history, and its developmental condition. In support of Schneirla's insight, there is now a substantial body of evidence showing that an infant's responsiveness to external sensory stimulation is not determined simply by the physical nature of the sensory input provided; rather, the same stimulus can have markedly different effects on the neonate, depending on the amount of concurrent stimulation to which the infant is exposed and on the infant's current level of arousal (see Gardner, Lewkowicz, Karmel, & Rose, 1986; Lewkowicz & Turkewitz, 1981; Lickliter & Lewkowicz, 1995; Radell & Gottlieb, 1992, for examples from both animal and human infants). Quantitative variations in stimulation in one modality can produce systematic changes in responsiveness in another modality, and it is possible to modify the attentional "value" of a given stimulus by altering either the infant's internal state or the amount of external sensory stimulation provided.

This principle of reciprocal determination underscores the insight that early intersensory relationships are affected by the stage, state, and experiential history of the organism, the nature and history of sensory stimulation provided or denied, and the larger physical, social, and temporal context in which development occurs. In other words, context and specific stimulus features both become dominant behavioral determinants, and a depiction of the bidirectional traffic between levels is crucial to a developmental understanding of individual functioning.

BROADER IMPLICATIONS OF A DEVELOPMENTAL PSYCHOBIOLOGICAL SYSTEMS VIEW

In this chapter, we have applied the systems view of psychobiological development only to developmental behavior genetics and to intersensory integration in the infant; therefore, we wish to close our account by calling attention to the wider applicability of the systems concept to human development.

Although there is considerable evidence for vertical as well as horizontal bidirectionality of influences among the four levels of analysis depicted in Figure 5.6 (environment, behavior, neural activity, genetic expression), the top-down flow has not yet been widely understood and appreciated in developmental psychology. Waddington's (1957, p. 36, Figure 5.5) unidirectional understanding of genetic canalization has been the predominant approach for many years and is still promoted in some quarters of developmental psychology (Fishbein, 1976; Kovach & Wilson, 1988; Lumsden & Wilson, 1980; Parker & Gibson, 1979; Scarr, 1993; Scarr-Salapatek, 1976; Sperry, 1951, 1971).

Because the influence of environmental factors on genetic expression is presently being pursued in a number of neuroscience and neurogenetic laboratories, there is now considerable evidence to document that genetic activity is responsive to the developing organism's external environment (Gottlieb, 1992, 1996). In an early example, Ho (1984) induced a second set of wings on fruit flies by exposing them to ether during a certain period of embryonic development; the ether altered the cytoplasm of the cells and thus the protein produced by the DNA-RNA-cytoplasm coactional relationship. This particular influence has the potential for a nontraditional evolutionary pathway in that it continues to operate transgenerationally, as do the effects of many drugs and other substances (Campbell & Perkins, 1988). Because there are now so many empirical demonstrations of external sensory and internal neural events that both excite and inhibit gene expression, the phenomenon has been labeled "immediate early gene expression" (e.g., Anokhin et al., 1991; Calamandrei & Keverne, 1994; Mack & Mack, 1992; Rustak et al., 1990).

In contrast to the (usually) unidirectional bottom-up flow still prominent in developmental psychology, at the behavior-environment level of analysis, bidirectionality was prominently recognized as early as J. M. Baldwin's (1906) "circular reaction," Vygotsky's (van der Veer &

Valsiner, 1991) emphasis on persons' coactions with their cultural worlds, and William Stern's (1938) personology or person-*Umwelt* relatedness, among many other more recent examples (Fischer, Bullock, Rotenberg, & Raya, 1993; Ford & Lerner, 1992).

In a recent comparison of the recognition of bidirectional influences in theoretical accounts of biology, psychology, and sociology, although psychological theory recognizes vertical bidirectionality at the environment-behavior level and micro to macro unidirectional flow at the gene to neural level, sociological theory predominantly sees unidirectional vertical influences at the environment-behavior level and a consequent lack of persons affecting their social and cultural worlds (Shanahan, Valsiner, & Gottlieb, 1997). Indeed, Shanahan et al. concluded that, although examples of bidirectionality can be found across disciplines, unidirectional thinking is still quite common. Only recently have biologists found the macro to micro flow empirically justified, and this top-down influence has not yet taken hold in biology and psychology as a whole (for an exception in developmental psychopathology, see Cicchetti & Tucker, 1994). Sociologists, on the other hand, have not yet widely embraced the micro to macro flow of influences at the behavior-environment level.

Probabilistic Epigenesis

The probable nature of epigenetic development is rooted in the reciprocal coactions that take place in complex systems, as shown in Figures 5.6 and 5.8.

Since the overthrow of biological preformation in favor of epigenesis in the nineteenth century, it has been recognized that development takes place sequentially and is therefore an emergent phenomenon. And since the advent of experimental embryology in the late nineteenth century, it is an accepted fact that cellular and organismic development occurs as a consequence of coactions at all levels from the genes to the developing organism itself. With the gradual realization that influences in developmental systems are fully bidirectional and that genes do not, in and of themselves, produce finished (i.e., mature) traits, the predetermined concept of epigenesis has receded from all but a few viewpoints in biology and psychology (cf. Scarr, 1993). Epigenesis is now defined as increased complexity of organization: the emergence of new structural and functional properties and competencies as a consequence of horizontal and vertical coactions among the system's parts, including organism-environment coactions (Gottlieb, 1991). As noted in the first part of this chapter on a developmental psychobiological systems view, the emergent nature of development is represented well in the concept of equifinality.

As concluded by Shanahan et al. (1997), probabilistic epigenesis is in accord with Baldwin's (1906) understanding of developmental phenomena. The stochastic nature of developmental phenomena ultimately derives from the range of responses at any given level. Thus, responses to tension can vary within levels; and given that responses to stress occur in highly related sets of behavior (i.e., they are organized), there will be variability in the overall patterns between levels. London's (1949) argument for the "behavioral spectrum" exemplifies the concern for a range of responses. From this perspective, developmental phenomena cannot be represented so as to imply subsequent derivations, though they can suggest classes of outcomes. This notion is captured well by Fischer; in his theory of cognition, he adopts the principles of adaptive resonance theory to explain the generation of multiple cognitive forms in ontogeny (Fischer et al., 1993).

Thus, the hallmarks of probabilistic epigenesis—bidirectionality and indeterminacy—are being ever more widely used in developmental psychology, even if they are not yet majority opinions among psychological theorists who are not steeped in our own history of conceptualizing behavior-environment relations, or who have yet to grasp the recent empirical breakthroughs in our understanding of biological development.

SUMMARY AND CONCLUSION

Developmental thinking began in the early 1800s, coincident with the triumph of epigenesis over the concept of preformation. Though practiced only at the descriptive level in this early period, it led to the insight that to understand the origin of any phenotype, it is necessary to study its development in the individual. Late in the 1800s, developmental description was superceded by an experimental approach in embryology—one explicitly addressed to a theoretical understanding and explanation of developmental outcomes. A field or systems view was born when the results of Hans Driesch's experiments made it necessary to conceptualize embryonic cells as harmonious-equipotential systems. Steer-

ing a careful path between mechanical-reductive and vitalistic-constructive viewpoints, in the 1930s, Ludwig von Bertalanffy formalized an organismic systems view for experimental embryology, which was later worked out in more formal detail by the embryologist Paul Weiss and the physiologically oriented population geneticist, Sewall Wright.[6] At present, a systems view of psychobiological development has begun to take hold in developmental psychology, developmental neurobiology, and behavioral genetics. Thus, although there are dissenters, a psychobiological systems view seems workable and useful in understanding human as well as nonhuman animal psychological development.

A systems view of psychobiological development is a useful framework to guide experiment and theory. It is quite rewarding to those who work with nonhuman animals to note that Ford and Lerner (1992) explicitly advocate the utility of a systems concept for developmental psychologists who work with human beings. As noted earlier, similar points of view have been put forward by psychobiologically oriented developmentalists such as Cairns et al. (1990), Edelman (1988), Griffiths and Gray (1994), Hinde (1990), Johnston and Edwards (2002), Magnusson and Törestad (1993), and Oyama (1985), and this represents a realization of the pioneering theoretical efforts of Z.-Y. Kuo, T. C. Schneirla, and D. S. Lehrman. Because a developmental systems view dates back as far as Hans Driesch's theorizing about his embryological experiments in the 1890s, one cannot call it a "paradigm shift," but certainly it is something relatively new in the field of developmental psychology.

REFERENCES

Adams, M. D., Celniker, S. E., Holt, R. A., Evans, C. A., Gocayne, J. D., Amanatides, P. G., et al. (2000). The genome sequence of drosophila melanogaster. *Science, 287,* 2185–2195.

Adolph, K. E., Eppler, M. A., & Gibson, E. J. (1993). Development of perception of affordances. In C. Rovee-Collier & L. P. Lipsitt (Eds.), *Advances in infancy research* (Vol. 8, pp. 5l–58). Norwood, NJ: Ablex.

Alberts, J. R. (1984). Sensory-perceptual development in the Norway rat: A view toward comparative studies. In R. Kail & N. S. Spear (Eds.), *Comparative perspectives on memory development* (pp. 65–101). Hillsdale, NJ: Erlbaum.

[6] Some observers note that, with the advent of molecular biology, systems or organismic thinking has taken a back seat to genetic determinism in the field of biology (Strohman, 1997).

Allen, G. E. (1985). Heredity under an embryological paradigm: The case of genetics and embryology. *Biological Bulletin, 168,* 107–121.

Alonso, J. M., Stepanova, A. N., Leisse, T. J., Kim, C. J., Chen, H. M., Shinn, P., et al. (2003). Genome-wide insertional mutagenesis of arabidopsis thaliana. *Science, 301,* 653–657.

Anni, H., & Israel, Y. (2002). Proteomics in alcohol research. *Alcohol Research and Health, 26,* 219–232.

Anokhin, K. V., Milevsnic, R., Shamakina, I. Y., & Rose, S. (1991). Effects of early experience on c-fos gene expression in the chick forebrain. *Brain Research, 544,* 101–107.

Aslin, R., & Smith, L. B. (1988). Perceptual development. *Annual Review of Psychology, 39,* 435–473.

Bahrick, L. E. (1987). Infants' intermodal perception of two levels of temporal structure in natural events. *Infant Behavior and Development, 10,* 387–416.

Bahrick, L. E. (2000). Increasing specificity in the development of intermodal perception. In D. Muir & A. Slater (Eds.), *Infant development: The essential readings* (pp. 90–120). Oxford, England: Blackwell.

Bahrick, L. E., & Lickliter, R. (2000). Intersensory redundancy guides attentional selectivity and perceptual learning in infancy. *Developmental Psychology, 36,* 190–201.

Bahrick, L. E., & Lickliter, R. (2002). Intersensory redundancy guides early perceptual and cognitive development. In R. Kail (Ed.), *Advances in Child Development and Behavior* (Vol. 30, pp. 153–187). New York: Academic Press.

Bahrick, L. E., Lickliter, R., & Flom, R. (2004). Intersensory redundancy guides infants' selective attention, perceptual and cognitive development. *Current Directions in Psychological Science, 13,* 99–102.

Bahrick, L. E., & Pickens, J. (1994). Amodal relations: The basis for intermodal perception and learning in infancy. In D. J. Lewkowicz & R. Lickliter (Eds.), *The development of inter-sensory perception: Comparative perspectives* (pp. 205–234). Hillsdale, NJ: Erlbaum.

Baldwin, J. M. (1906). *Thought and things: A study of the development and meaning of thought, or genetic logic: Vol. 1. Functional logic or genetic theory of knowledge.* London: Swan Sonnenschein.

Banker, H., & Lickliter, R. (1993). Effects of early and delayed visual experience on intersensory development in bobwhite quail chicks. *Developmental Psychobiology, 26,* 155–170.

Bateson, W. (1913). *Mendel's principles of heredity.* Cambridge, England: Cambridge University Press.

Beasley, A. B., & Crutchfield, F. L. (1969). Development of a mutant with abnormalities of the eye and extremities. *Anatomical Record, 163,* 293.

Belknap, J. K., Hitzemann, R., Crabbe, J. C., Phillips, T. J., Buck, K. J., & Williams, R. W. (2001). QTL analysis and genomewide mutagenesis in mice: Complementary genetic approaches to the dissection of complex traits. *Behavior Genetics, 31,* 5–15.

Bellugi, U., Wang, P. P., & Jernigan, T. L. (1994). Williams syndrome: An unusual neuropsychological profile. In S. H. Broman & J. Grafman (Eds.), *Atypical cognitive deficits in developmental disorders: Implications for brain functions* (pp. 23–56). Hillsdale, NJ: Erlbaum.

Bertelson, P., & de Gelder, B. (2004). The psychology of multimodal perception. In C. Spence & J. Driver (Eds.), *Crossmodal space and crossmodal attention.* Oxford, England: Oxford University Press.

Bertenthal, B. I., & Campos, J. J. (1990). A systems approach to the organizing effects of self-produced locomotion during infancy. *Advances in Infancy Research, 6,* 51–98.

Biddle, F. G., & Eales, B. A. (1999). Mouse genetic model for left-right hand usage: Context, direction, norms of reaction, and memory. *Genome, 42,* 1150–1166.

Birch, H., & Lefford, A. (1963). Intersensory development in children. *Monographs of the Society for Research in Child Development, 28*(5, Serial No. 89).

Birch, H., & Lefford, A. (1967). Visual differentiation, intersensory integration, and voluntary motor control. *Monographs of the Society for Research in Child Development, 32*(1/2, Serial No. 110).

Bjorklund, D. (1995). *Children's thinking: Developmental function and individual differences.* New York: Brooks/Cole.

Black, I. B. (1993). Environmental regulation of brain trophic interactions. *International Journal of Developmental Neuroscience, 11,* 403–410.

Black, J. E., & Greenough, W. T. (1998). Developmental approaches to the memory process. In J. L. Martinez Jr. & R. P. Kesner (Eds.), *Neurobiology of learning and memory* (pp. 55–88). San Diego, CA: Academic Press.

Blair, C., & Wahlsten, D. (2002). Why early intervention works. *Intelligence, 30,* 129–140.

Boklage, C. E. (1985). Interaction between opposite-sex dizygotic fetuses and the assumption of Weinberg difference method in epidemiology. *American Journal of Human Genetics, 37,* 591–605.

Born, D. E., & Rubel, E. W. (1988). Afferent influences in brain stem auditory nuclei of the chicken: Presynaptic action potentials regulate protein synthesis in nucleus magnocellularis neurons. *Journal of Neuroscience, 8,* 901–919.

Botuck, S., & Turkewitz, G. (1990). Intersensory functioning: Auditory-visual pattern equivalence in younger and older children. *Developmental Psychology, 26,* 115–120.

Bouchard, T. J., Jr., & McGue, M. (2003). Genetic and environmental influences on human psychological differences. *Journal of Neurobiology, 54,* 4–45.

Bradley, R. M., & Mistretta, C. A. (1975). Fetal sensory receptors. *Physiological Reviews, 55,* 352–382.

Branchi, I., & Ricceri, L. (2002). Transgenic and knock-out mouse pups: The growing need for behavioral analysis. *Genes, Brain, and Behavior, 1,* 135–141.

Bredy, T. W., Grant, R. J., Champagne, D. L., & Meaney, M. J. (2003). Maternal care influences neuronal survival in the hippocampus of the rat. *European Journal of Neuroscience, 18,* 2903–2909.

Brenner, S. (2003). Humanity as the model system. *Science, 302,* 533.

Brunswik, E. (1952). *The conceptual framework of psychology.* Chicago: University of Chicago Press.

Brunswik, E. (1956). *Perception and the representative design of experiments in psychology.* Berkeley: University of California Press.

Bull, J. J. (1983). *Evolution of sex determining mechanisms.* Menlo Park, CA: Benjamin/Cummings.

Bulman-Fleming, B., & Wahlsten, D. (1988). Effects of a hybrid maternal environment on brain growth and corpus callosum defects of inbred BALB/c mice: A study using ovarian grafting. *Experimental Neurology, 99,* 636–646.

Bulman-Fleming, B., & Wahlsten, D. (1991). The effects of intrauterine position on the degree of corpus callosum deficiency in two substrains of BALB/c mice. *Developmental Psychobiology, 24,* 395–412.

Burt, C. (1909). Experimental tests of general intelligence. *British Journal of Psychology, 3,* 94–177.

Bushnell, E. W. (1982). Visual-tactual knowledge in 8-, 9½-, and 11-month old infants. *Infant Behavior and Development, 5,* 65–75.

Bushnell, E. W. (1994). A dual-processing approach to cross-modal matching: Implications for development. In D. J. Lewkowicz & R. Lickliter (Eds.), *The development of inter-sensory perception: Comparative perspectives* (pp. 19–38). Hillsdale, NJ: Erlbaum.

Bushnell, E. W., & Boudreau, J. P. (1993). Motor development in the mind: The potential role of motor abilities as a determinant of aspects of perceptual development. *Child Development, 64,* 1005–1021.

Bushnell, E. W., Shaw, L., & Strauss, B. (1985). The relationship between visual and tactual exploration by 6-month-olds. *Developmental Psychology, 21,* 591–600.

Busnel, M. C., Granier-Deferre, C., & Lecanuet, J. P. (1992). Fetal audition. *Annals of the New York Academy of Sciences, 662,* 118–134.

Cairns, R. B., Gariépy, J.-L., & Hood, K. E. (1990). Development, microevolution, and social behavior. *Psychological Review, 97,* 49–65.

Cairns, R. B., MacCombie, D. J., & Hood, K. E. (1983). A developmental-genetic analysis of aggressive behavior in mice: Pt. 1. 56 behavioral outcomes. *Journal of Comparative Psychology, 97,* 69–89.

Calamandrei, G., & Keverne, E. B. (1994). Differential expression of Fos protein in the brain of female mice is dependent on pup sensory cues and maternal experience. *Behavioral Neuroscience, 108,* 113–120.

Calvert, G., Spence, J., & Stein, B. E. (2004). *The handbook of multisensory processes.* Cambridge, MA: MIT Press.

Campbell, J. H., & Perkins, P. (1988). Transgenerational effects of drug and hormone treatments in mammals. *Progress in Brain Research, 75,* 535–553.

Capron, C., & Duyme, M. (1989). Assessment of effects of socioeconomic status on IQ in a full cross-fostering study. *Nature, 340,* 552–553.

Carlier, M., Nosten-Bertrand, M., & Mjchard-Vanhée, C. (1992). Separating genetic effects from maternal environmental effects. In D. Goldowitz, B. Wahlsten, & R. E. Wimer (Eds.), *Techniques for the genetic analysis of brain and behavior* (pp. 111–126). Amsterdam: Elsevier.

Carlier, M., Roubertoux, P., Kottler, M. L., & Degrelle, H. (1989). Y chromosome and aggression in strains of laboratory mice. *Behavior Genetics, 20,* 137–156.

Carlier, M., Roubertoux, P. L., & Pastoret, C. (1991). The Y chromosome effect on intermale aggression in mice depends on the maternal environment. *Genetics, 129,* 231–236.

Caspi, A., Sugden, K., Moffitt, T. E., Taylor, A., Craig, I. W., Harrington, H., et al. (2002). Influence of life stress on depression: Moderation by a polymorphism in the 5-HTT gene. *Science, 301,* 386–389.

Changeux, J.-P., & Konishi, M. (Eds.). (1987). *The neural and molecular bases of learning.* Chichester, England: Wiley.

Cheng, M.-F. (1979). Progress and prospects in ring dove: A personal view. *Advances in the Study of Behavior, 9,* 97–129.

Chesler, E. J., Wilson, S. G., Lariviere, W. R., Rodriguez-Zas, S. L., & Mogil, J. S. (2002). Influences of laboratory environment on behavior. *Nature Neuroscience, 5,* 1101–1102.

Cicchetti, D. V., & Tucker, D. (1994). Development and self-regulatory structures of the mind. *Development and Psychopathology, 6,* 533–549.

Clifton, R. K., Rochat, P., Robin, D. J., & Berthier, W. E. (1994). Multimodal perception in the control of infant reaching. *Journal of Experimental Psychology: Human Perception and Performance, 20,* 876–886.

Collins, R. L. (1985). On the inheritance of direction and degree of asymmetry. In S. D. Glick (Ed.), *Cerebral lateralization in nonhuman species* (pp. 41–71). New York: Academic Press.

Columbus, R., & Lickliter, R. (1998). Modified sensory features of social stimulation alters the perceptual responsiveness of bobwhite quail chicks. *Journal of Comparative Psychology, 112,* 161–169.

Crabbe, J. C. (2002). Genetic contributions to addiction. *Annual Review of Psychology, 53,* 435–462.

Crabbe, J. C., Wahlsten, D., & Dudek, B. C. (1999). Genetics of mouse behavior: Interactions with laboratory environment. *Science, 284,* 1670–1672.

Crusio, W. E. (2004). Flanking gene and genetic background problems in genetically manipulated mice. *Biological Psychiatry, 56,* 381–385.

DeCasper, A. J., & Spence, M. J. (1986). Prenatal maternal speech influences newborns' perception of speech sounds. *Infant Behavior and Development, 9,* 133–150.

Dent, C. H. (1990). An ecological approach to language development: An alternative to functionalism. *Developmental Psychobiology, 23,* 679–703.

Detterman, D. K. (1990). Don't kill the ANOVA messenger for bearing bad interaction news. *Behavioral and Brain Sciences, 13,* 131–132.

Devlin, B., Daniels, M., & Roeder, K. (1997). The heritability of IQ. *Nature, 388,* 468–471.

DiBerardino, M. A. (1988). Genomic multipotentiality in differentiated somatic cells. In G. Eguchi, T. S. Okada, & L. Saxén (Eds.), *Regulatory mechanisms in developmental processes* (pp. 129–136). Ireland: Elsevier.

Dodart, J.-C., Mathis, C., Bales, K. R., & Paul, S. M. (2002). Does my mouse have Alzheimer's disease? *Genes, Brain, and Behavior, 1,* 142–155.

Dodd, B. (1979). Lip reading in infants: Attention to speech presented in-and-out of synchrony. *Cognitive Psychology, 11,* 478–484.

Driesch, H. (1929). *The science and philosophy of the organism.* London: A. & C. Black. (Original manuscript published 1908)

Edelman, G. (1987). *Neural Darwinism.* New York: Basic Books.

Edelman, G. (1988). *Topobiology.* New York: Basic Books.

Edelman, G. (1992). *Bright air, brilliant fire: On the matter of mind.* New York: Basic Books.

Edenberg, H. J., Dick, D. M., Xuei, X. L., Tian, H. J., Almasy, L., Bauer, I. O., et al. (2004). Variations in *GABRA2,* encoding the a 2 subunit of the $GABA_A$ receptor, are associated with alcohol dependence and with brain oscillations. *American Journal of Human Genetics, 74,* 705–714.

Eilers, R., Oller, D. K., Levine, S., Basinger, O., Lynch, M., & Urbano, R. (1993). The role of prematurity and socioeconomic status in the onset of canonical babbling in infants. *Infant Behavior and Development, 16,* 297–316.

Erlenmeyer-Kimling, L. (1972). Genotype-environment interactions and the variability of behavior. In L. Ehrman, G. S. Omenn, & E. Caspari (Eds.), *Genetics, environment and behavior* (pp. 181–208). New York: Academic Press.

Farber, S. L. (1981). *Identical twins reared apart. A reanalysis.* New York: Basic Books.

Ferguson, M. W. J., & Joanen, T. (1982). Temperature of egg incubation determines sex in alligator mississippiensis. *Nature, 296,* 850–853.

Finch, C. E., & Kirkwood, T. B. L. (2000). *Chance, development, and aging.* New York: Oxford University Press.

Fischer, K. W. (1980). A theory of cognitive development: The control and construction of hierarchies of skill. *Psychological Review, 87,* 477–531.

Fischer, K. W., Bullock, D. H., Rotenberg, E. J., & Raya, P. (1993). The dynamics of competence: How context contributes directly to skill. In R. H. Wozniak & K. W. Fischer (Eds.), *Development in context* (pp. 93–120). Hillsdale, NJ: Erlbaum.

Fishbein, H. D. (1976). *Evolution, development, and children's learning.* Pacific Palisades, CA: Goodyear.

Flint, J. (2003). Analysis of quantitative trait loci that influence animal behavior. *Journal of Neurobiology, 54,* 46–77.

Fogel, A. (1993). *Developing through relationships: Origins of communication, self, and culture.* Chicago: University of Chicago Press.

Ford, D. H., & Lerner, R. M. (1992). *Developmental systems theory: An integrative approach.* Newbury Park, CA: Sage.

Foreman, N., & Altaha, M. (1991). The development of explorations and spontaneous alteration in hooded rat pups: Effects of unusually early eyelid opening. *Developmental Psychobiology, 24,* 521–537.

Foushee, R., & Lickliter, R. (2002). Early visual experience affects postnatal auditory responsiveness in bobwhite quail. *Journal of Comparative Psychology, 116,* 369–380.

Freeman, N. J. (1991). The physiology of perception. *Scientific American,* 78–85.

Friedes, D. (1974). Human information processing and sensory modality: Cross-modal functions, information complexity, memory, and deficit. *Psychological Bulletin, 81,* 284–310.

Gardner, J. M., & Karmel, B. Z. (1984). Arousal effects on visual preferences in neonates. *Developmental Psychology, 20,* 374–377.

Gardner, J. M., Lewkowicz, D. J., Karmel, B. Z., & Rose, S. A. (1986). Effects of visual and auditory stimulation on subsequent visual preferences in neonates. *International Journal of Behavioral Development, 9,* 251–263.

Gariépy, J.-L. (1995). The making of a developmental science: Historical and contemporary trends in animal behavior research. *Annals of Child Development, 11,* 167–224.

Gärtner, K. (1990). A third component causing random variability beside environment and genotype: A reason for the limited success of a 30-year-long effort to standardize laboratory animals? *Laboratory Animals, 24,* 71–77.

Gerlai, R. (1996). Gene-targeting studies of mammalian behavior: Is it the mutation or the background genotype? *Trends in Neurosciences, 19,* 177–181.

Giaever, G., Chu, A. M., Ni, L., Connelly, C., Riles, L., Veronneau, S., et al. (2002). Functional profiling of the saccharomyces cerevisiae genome. *Nature, 418,* 387–391.

Gibson, E. J. (1969). *Principles of perceptual learning and development.* Englewood Cliffs, NJ: Prentice-Hall.

Gibson, E. J., & Pick, A. (2000). *The ecological approach to perceptual learning and development.* Oxford, England: Oxford University Press.

Gibson, J. J. (1966). *The senses considered as perceptual systems.* Boston: Houghton-Mifflin.

Gibson, J. J. (1979). *The ecological approach to visual perception.* Boston: Houghton-Mifflin.

Giot, L., Bader, J. S., Brouwer, C., Chaudhuri, A., Kuang, B., Li, Y., et al. (2003). A protein interaction map of drosophila melanogaster. *Science, 302,* 1727–1736.

Goldin-Meadow, S. (1997). The resilience of language in humans. In C. T. Snowden & M. Hausberger (Eds.), *Social influences on vocal development* (pp. 243–311). New York: Cambridge University Press.

Gottlieb, G. (1970). Conceptions of prenatal behavior. In L. R. Aronson, E. Tobach, D. S. Lehrman, & J. S. Rosenblatt (Eds.),

Development and evolution of behavior (pp. 111–137). San Francisco: Freeman.

Gottlieb, G. (1971a). *Development of species identification in birds: An inquiry into the prenatal determinants of perception.* Chicago: University of Chicago Press.

Gottlieb, G. (1971b). Ontogenesis of sensory function in birds and mammals. In E. Tobach, L. R. Aronson, & E. Shaw (Eds.), *The biopsychology of development* (pp. 67–128). New York: Academic Press.

Gottlieb, G. (1976). Conceptions of prenatal development: Behavioral embryology. *Psychological Review, 83,* 215–234.

Gottlieb, G. (1991). Experiential canalization of behavioral development: Theory. *Developmental Psychology, 27,* 4–13.

Gottlieb, G. (1992). *Individual development and evolution: The genesis of novel behavior.* New York: Oxford University Press.

Gottlieb, G. (1993). Social induction of malleability in ducklings: Sensory basis and psychological mechanism. *Animal Behaviour, 45,* 707–719.

Gottlieb, G. (1995). Some conceptual deficiencies in "developmental" behavior genetics. *Human Development, 38,* 131–141.

Gottlieb, G. (1996). A systems view of psychobiological development. In D. Magnusson (Ed.), *Individual development over the lifespan: Biological and psychosocial perspectives* (pp. 76–103). New York: Cambridge University Press.

Gottlieb, G. (1997). *Synthesizing nature-nurture: Prenatal roots of instinctive behavior.* Mahwah, NJ: Erlbaum.

Gottlieb, G. (1998). Normally occurring environmental and behavioral influences on gene activity: From central dogma to probabilistic epigenesis. *Psychological Review, 105,* 792–892.

Gottlieb, G., & Halpern, C. T. (2002). A relational view of causality in normal and abnormal development. *Development and Psychopathology, 14,* 421–435.

Gottlieb, G., & Lickliter, R. (2004). The various roles of animal models in understanding human development. *Social Development, 13,* 311–323.

Gottlieb, G., & Simner, M. L. (1969). Auditory versus visual flicker in directing the approach response of domestic chicks. *Journal of Comparative and Physiological Psychology, 67,* 58–63.

Gottlieb, G., Tomlinson, W. T., & Radell, P. L. (1989). Developmental intersensory interference: Premature visual experience suppresses auditory learning in ducklings. *Infant Behavior and Development, 12,* 1–12.

Gottlieb, G., & Vandenbergh, J. (1968). Ontogeny of vocalization in duck and chick embryos. *Journal of Experimental Zoology, 168,* 307–325.

Gould, S. J. (1977). *Ontogeny and phylogeny.* Cambridge, MA: Harvard University Press.

Greenough, W. T., Black, J. E., Klintsova, A., Bates, K. E., & Weiler, I. J. (1999). Experience and plasticity in brain structure: Possible implications of basic research findings for developmental disorders. In S. H. Broman & J. M. Fletcher (Eds.), *The changing nervous system* (pp. 51–70). New York: Oxford University Press.

Greenough, W. T., Cohen, N. J., & Juraska, J. M. (1999). New neurons in old brains: Learning to survive? *Nature Neuroscience, 2,* 203–205.

Greenspan, R. J. (1997). A kinder, gentler genetic analysis of behavior: Dissection gives way to modulation. *Current Opinion in Neurobiology, 7,* 805–811.

Greenspan, R. J. (2004). E pluribus unum, ex uno plura: Quantitative and single-gene perspectives on the study of behavior. *Annual Review of Neuroscience, 27,* 79–105.

Griffiths, P. E., & Gray, R. D. (1994). Developmental systems and evolutionary explanation. *Journal of Philosophy, 91,* 277–304.

Grun, P. (1976). *Cytoplasmic genetics and evolution.* New York: Columbia University Press.

Guo, S. W. (1999). The behaviors of some heritability estimators in the complete absence of genetic factors. *Human Heredity, 49,* 215–228.

Haldane, J. B. S. (1938). *Heredity and politics.* London: Allen & Unwin.

Hamburger, V. (1957). The concept of "development" in biology. In D. H. Harris (Ed.), *The concept of development* (pp. 49–58). Minneapolis: University of Minnesota.

Hamburger, V. (1964). Ontogeny of behaviour and its structural basis. In D. Richter (Ed.), *Comparative neurochemistry* (pp. 21–34). Oxford, England: Pergamon Press.

Harris, W. A. (1981). Neural activity and development. *Annual Review of Physiology, 43,* 689–710.

Heath, A. C., & Nelson, E. C. (2002). Effects of the interaction between genotype and environment. *Alcohol Research and Health, 26,* 193–201.

Henfry, A., & Huxley, T. H. (1853). *Scientific memoirs, selected from the transactions of foreign academies of science, and from foreign journals: Natural history.* London: Taylor & Francis.

Henry, K. R., & Bowman, R. E. (1970). Behavior-genetic analysis of the ontogeny of acoustically primed audiogenic seizures in mice. *Journal of Comparative and Physiological Psychology, 70,* 235–241.

Hinde, R. A. (1990). The interdependence of the behavioural sciences. *Philosophical Transactions of the Royal Society, London, B329,* 217–227.

His, W. (1888). On the principles of animal morphology. *Proceedings of the Royal Society of Edinburgh, 15,* 287–298.

Ho, M.-W. (1984). Environment and heredity in development and evolution. In M.-W. Ho & P. T. Saunders (Eds.), *Beyond neo-Darwinism: An introduction to the new evolutionary paradigm* (pp. 267–289). San Diego, CA: Academic Press.

Hoffman, L. W. (1991). The influence of the family environment on personality: Accounting for sibling differences. *Psychological Bulletin, 110,* 187–203.

Honeycutt, H., & Lickliter, R. (2003). The influence of prenatal tactile and vestibular stimulation on auditory and visual responsiveness in bobwhite quail: A matter of timing. *Developmental Psychobiology, 43,* 71–81.

Hood, K. E., & Cairns, R. B. (1989). A developmental-genetic analysis of aggressive behavior in mice: Pt. 4. Genotype-environment interaction. *Aggressive Behavior, 15,* 361–380.

International Human Genome Sequencing Consortium. (2004). Finishing the euchromatic sequence of the human genome. *Nature, 431,* 931–945.

Jacobson, M. (1981). Rohon-Beard neurons arise from a substitute ancestral cell after removal of the cell from which they normally arise in the 16-cell frog embryo. *Journal of Neuroscience, 1,* 923–927.

Jacobson, M. (1991). *Developmental neurobiology* (3rd ed.). New York: Plenum Press.

Jessberger, S., & Kempermann, G. (2003). Adult-born hippocampal neurons mature into activity-dependent responsiveness. *European Journal of Neuroscience, 18,* 2707–2712.

Johnston, T. D. (1988). Developmental explanation and the ontogeny of birdsong: Nature/nurture redux. *Behavioral and Brain Sciences, 11,* 617–663.

Johnston, T. D., & Edwards, L. (2002). Genes, interactions, and the development of behavior. *Psychological Review, 109,* 26–34.

Johnston, T. D., & Gottlieb, G. (1981). Development of visual species identification in ducklings: What is the role of imprinting? *Animal Behaviour, 29,* 1082–1099.

Johnston, T. D., & Gottlieb, G. (1990). Neophenogenesis: A development theory of phenotypic evolution. *Journal of Theoretical Biology, 147,* 471–495.

Julien, J.-P., Tretjakoff, I., Beaudet, L., & Peterson, A. (1987). Expression and assembly of a human neurofilament protein in transgenic mice provide a novel neuronal marking system. *Genes and Development, 1,* 1085–1095.

Kasai, H., Matsuzaki, M., Noguchi, J., Yasumatsu, N., & Nakahara, H. (2003). Structure-stability-function relationships of dendritic spines. *Trends in Neurosciences, 26,* 360–368.

Keller, E. F. (2000). *The century of the gene.* Cambridge, MA: Harvard University Press.

Kellman, P. J., & Arterberry, M. E. (1998). *The cradle of knowledge: Development of perception in infancy.* Cambridge, MA: MIT Press.

Kempermann, G., & Gage, F. H. (1999). New nerve cells for the adult brain. *Scientific American, 280,* 48–53.

Kenny, P., & Turkewitz, G. (1986). Effects of unusually early visual stimulation on the development of homing behavior in the rat pup. *Developmental Psychobiology, 19,* 57–66.

Kidd, K. K., Pakstis, A. J., Castiglione, C. M., Kidd, J. R., Speed, W. C., Goldman, D., et al. (1996). DRD2 halotypes containing the TaqI A1 allele: Implications for alcoholism research. *Alcoholism: Clinical and Experimental Research, 20,* 697–705.

Kim, S. K., Lund, J., Kiraly, M., Duke, K., Jiang, M., Stuart, J. M., et al. (2001). A gene expression map for caenorhabditis elegans. *Science, 293,* 2087–2092.

King, A. J., Hutchings, M. E., Moore, D. R., & Blackmore, C. (1988). Developmental plasticity in the visual and auditory representations in the mammalian superior colliculus. *Nature, 332,* 73–76.

Knudsen, E. I. (1983). Early auditory experience aligns the auditory map of space in the optic tectum of the barn owl. *Science, 222,* 939–942.

Knudsen, E. I. (1985). Experience alters the spatial tuning of auditory units in the optic tectum during a sensitive period in the barn owl. *Journal of Neuroscience, 5,* 3094–3109.

Knudsen, E. I., & Brainard, M. S. (1991). Visual instruction of the neural map of auditory space in the developing optic tectum. *Science, 253,* 85–87.

Knudsen, E. I., & Knudsen, P. F. (1989). Vision calibrates sound localization in developing barn owls. *Journal of Neuroscience, 9,* 3306–3313.

Kovach, J. K., & Wilson, G. (1988). Genetics of color preferences in quail chicks: Major genes and variable buffering by background genotype. *Behavior Genetics, 18,* 645–661.

Kubovy, M. (1988). Should we resist the seductiveness of the space-time-vision-auditory analogy? *Journal of Experimental Psychology: Human Perception and Performance, 14,* 318–320.

Kuhl, P. K., & Meltzoff, A. N. (1984). The intermodal representation of speech in infants. *Infant Behavior and Development, 7,* 361–381.

Kuhn, D. (1995). Microgenetic study of change: What has it told us? *Psychological Science, 3,* 133–139.

Kuo, Z.-Y. (1967). *The dynamics of behavior development.* New York: Random House.

Kuo, Z.-Y. (1976). *The dynamics of behavior development* (Enlarged ed.). New York: Plenum Press.

Layton, W. M., Jr. (1976). Random determination of a developmental process: Reversal of normal visceral asymmetry in the mouse. *Journal of Heredity, 67,* 336–338.

Lee, S. M., & Bressler, R. (1981). Prevention of diabetic nephropathy by diet control in the *db/db* mouse. *Diabetes, 30,* 106–111.

Lee, T. I., Rinaldi, N. J., Robert, F., Odom, D. T., Bar-Joseph, Z., Gerber, G. K., et al. (2002). Transcriptional regulatory networks in saccharomyces cerevisiae. *Science, 298,* 799–804.

Lehrman, D. S. (1970). Semantic and conceptual issues in the nature-nurture problem. In L. R. Aronson, D. S. Lehrman, E. Tobach, & J. S. Rosenblatt (Eds.), *Development and evolution of behavior* (pp. 17–52). San Francisco: Freeman.

Lerner, R. M. (1988). Personality development: A life-span perspective. In E. M. Hetherington, R. M. Lerner, & M. Perlmutter (Eds.), *Child development in life-span perspective* (pp. 21–46). Hillsdale, NJ: Erlbaum.

Lerner, R. M. (1992). *Final solutions: Biology, prejudice, and genocide.* University Park: Pennsylvania State University Press.

Lerner, R. M. (1995). The limits of biological influence: Behavioral genetics as the emperor's new clothes. *Psychological Inquiry, 6,* 145–156.

Lewis, M. D., & Granic, I. (2000). *Emotion, development, and self-organization: Dynamic systems approaches to emotional development.* New York: Cambridge University Press.

Lewkowicz, D. J. (1985). Developmental changes in infants' response to temporal frequency. *Developmental Psychology, 21,* 850–865.

Lewkowicz, D. J. (1986). Developmental changes in infants' bisensory response to synchronous durations. *Infant Behavior and Development, 9,* 335–353.

Lewkowicz, D. J. (1988). Sensory dominance in infants: Pt. 1. Six-month-old infants' response to auditory-visual compounds. *Developmental Psychology, 24,* 155–171.

Lewkowicz, D. J. (2000). The development of intersensory temporal perception: An epigenetic systems/limitations view. *Psychological Bulletin, 126,* 281–308.

Lewkowicz, D. J. (2002). Heterogeneity and heterochrony in the development of intersensory perception. *Cognitive Brain Research, 14,* 41–63.

Lewkowicz, D. J., & Lickliter, R. (Eds.). (1994). *The development of intersensory perception: Comparative perspectives.* Hillsdale, NJ: Erlbaum.

Lewkowicz, D. J., & Turkewitz, G. (1980). Cross-modal equivalence in early infancy: Auditory-visual intensity matching. *Developmental Psychology, 16,* 597–607.

Lewkowicz, D. J., & Turkewitz, G. (1981). Intersensory interaction in newborns: Modification of visual preferences following exposure to sound. *Child Development, 52,* 827–832.

Lewontin, R. C. (1991). *Biology as ideology.* Concord, Ontario, Canada: House of Anansi Press.

Lickliter, R. (1990). Premature visual stimulation accelerates intersensory functioning in bobwhite quail neonates. *Developmental Psychobiology, 23,* 15–27.

Lickliter, R. (1993). Timing and the development of perinatal perceptual organization. In G. Turkewitz & D. A. Devenny (Eds.), *Developmental time and timing* (pp. 105–124). Hillsdale, NJ: Erlbaum.

Lickliter, R. (1994). Prenatal visual experience alters postnatal sensory dominance hierarchy in bobwhite quail chicks. *Infant Behavior and Development, 17,* 185–193.

Lickliter, R. (1995). Embryonic sensory experience and inter-sensory development in precocial birds. In J. P. Lecanuet, W. P. Fifer, N. A. Krasnegor, & W. P. Smotherman (Eds.), *Fetal development: A psychobiological perspective* (pp. 281–294). Hillsdale, NJ: Erlbaum.

Lickliter, R. (2000a). Atypical perinatal sensory stimulation and early perceptual development: Insights from developmental psychobiology. *Journal of Perinatology, 20,* 45–54.

Lickliter, R. (2000b). Kuo's epigenetic vision for psychological sciences: Dynamic developmental systems theory. *From past to future: Clark University Papers on the History of Psychology, 2,* 39–51.

Lickliter, R., & Bahrick, L. E. (2000). The development of infant intersensory perception: Advantages of a comparative covergent-operations approach. *Psychological Bulletin, 126,* 260–280.

Lickliter, R., & Berry, T. D. (1990). The phylogeny fallacy: Developmental psychology's misapplication of evolutionary theory. *Developmental Review, 10,* 322–338.

Lickliter, R., Dyer, A. B., & McBride, T. (1993). Perceptual consequences of early social interaction in precocial birds. *Behavioural Processes, 30,* 185–200.

Lickliter, R., & Gottlieb, G. (1985). Social interaction with siblings is necessary for visual imprinting of species-specific maternal preferences in ducklings (anas platyrhynchos). *Journal of Comparative Psychology, 99,* 371–379.

Lickliter, R., & Gottlieb, G. (1988). Social specificity: Interaction with own species is necessary to foster species-specific maternal preference in ducklings. *Developmental Psychobiology, 21,* 311–321.

Lickliter, R., & Lewkowicz, D. J. (1995). Intersensory experience and early perceptual development: Attenuated prenatal sensory stimulation affects postnatal auditory and visual responsiveness in bobwhite quail chicks. *Developmental Psychology, 31,* 609–618.

London, I. D. (1949). The concept of the behavioral spectrum. *Journal of Genetic Psychology, 24,* 177–184.

Lorenz, K. (1965). *Evolution and modification of behavior.* Chicago: University of Chigaco Press.

Lorenz, K. Z. (1981). *The foundations of ethology.* New York: Simon & Schuster.

Lumsden, C. J., & Wilson, E. O. (1980). Translation of epigenetic rules of individual behavior into ethnographic patterns. *Proceeding of the National Academy of Sciences, USA, 77,* 4382–4386.

Lupski, J. R., Garcia, C. A., Zoghbi, H. Y., Hoffman, E. P., & Fenwick, R. G. (1991). Discordance of muscular dystrophy in monozygotic female twins: Evidence supporting asymmetric splitting of the inner cell mass in a manifesting carrier of duchenne dystrophy. *American Journal of Medical Genetics, 40,* 354–364.

Mack, K. J., & Mack, P. A. (1992). Induction of transcription factors in somatosensory cortex after tactile stimulation. *Molecular Brain Research, 12,* 141–147.

Magnusson, D., & Törestad, B. (1993). A holistic view of personality: A model revisited. *Annual Review of Psychology, 44,* 427–452.

Mangold, O., & Seidel, F. (1927). Homoplastische und heteroplastische Verschmelzung ganzer Tritonkeime. *Roux's Archiv für Entwicklungsmechanik der Organismen, 111,* 593–665.

Marks, L. E. (1978). *The unity of the senses: Interrelations among the modalities.* New York: Academic Press.

Marshall, E. (2004). Getting the noise out of gene arrays. *Science, 306,* 630–631.

Mauro, V. P., Wood, I. C., Krushel, L., Crossin, K. L., & Edelman, G. M. (1994). Cell adhesion alters gene transcription in chicken embryo brain cells and mouse ernbryonal carcinoma cells. *Proceedings of the National Academy of Sciences, USA, 91,* 2868–2872.

McBride, T., & Lickliter, R. (1993). Visual experience with siblings fosters species-specific responsiveness to maternal visual cues in bobwhite quail chicks. *Journal of Comparative Psychology, 107,* 310–327.

McGue, M. (1989). Nature-nurture and intelligence. *Nature, 340,* 507–508.

McKinney, M. L., & McNamara, K. J. (1991). *Heterochrony: The evolution of ontogeny.* New York: Plenum Press.

Mellon, R., Kraemer, P., & Spear, N. (1991). Development of intersensory function: Age related differences in stimulus selection of multimodal compounds in rats as revealed by Pavlovian conditioning. *Journal of Experimental Psychology: Animal Behavior Processes, 17,* 448–464.

Meltzoff, A. N. (1990). Towards a developmental cognitive science: The implications of cross-modal matching and imitation for the development and representation and memory in infancy. In A. Diamond (Ed.), The development and neural bases of higher cognitive functions. *Annals of the New York Academy of Sciences, 608,* 1–31.

Mendelson, M. J., & Ferland, M. B. (1982). Auditory-visual transfer in 4-month-old infants. *Child Development, 53,* 1022–1027.

Miller, D. B., Hicinbothom, G., & Blaich, C. F. (1990). Alarm call responsivity of mallard ducklings: Multiple pathways in behavioural development. *Animal Behaviour, 39,* 1207–1212.

Moldin, S. O., Farmer, M. E., Chin, H. R., & Battey, J. F., Jr. (2001). Trans-NIH neuroscience initiatives on mouse phenotyping and mutagenesis. *Mammalian Genome, 12,* 575–581.

Moody, S. A. (1987). Fates of the blastomeres of the 16-cell stage Xenopus embryo. *Developmental Biology, 119,* 560–578.

Moore, D. S. (2001). *The dependent gene: The fallacy of "nature versus nurture."* New York: Henry Holt.

Mouse Genome Sequencing Consortium. (2002). Initial sequencing and comparative analysis of the mouse genome. *Nature, 420,* 520–562.

Muir, J. (1967). My first summer in the Sierra. In D. Brower (Ed.), *Gentle wilderness: The Sierra Nevada.* San Francisco: Sierra Club. (Original manuscript published 1911)

Müller, U. (1999). Ten years of gene targeting: Targeted mouse mutants, from vector design to phenotype analysis. *Mechanisms of Development, 82,* 3–21.

Nadeau, J. H., & Frankel, W. N. (2000). The road from phenotypic variation to gene discovery: Mutagenesis versus QTLs. *Nature Genetics, 25,* 381–384.

Nijhout, H. F. (2003). The importance of context in genetics. *American Scientist, 91,* 416–423.

Nisenbaum, L. K. (2002). The ultimate chip shot: Can microarray technology deliver for neuroscience? *Genes, Brain, and Behavior, 1,* 27–34.

Noel, M. (1989). Early development in mice: Pt. 5. Sensorimotor development of four coisogenic mutant strains. *Physiology and Behavior, 45,* 21–26.

O'Rahilly, R., & Müller, F. (1987). *Developmental stages in human embryos.* Washington, DC: Carnegie Institute.

Oyama, S. (1985). *The ontogeny of information: Developmental systems and evolution.* Cambridge, England: Cambridge University Press.

Ozaki, H. S., & Wahlsten, D. (1993). Cortical axon trajectories and growth cone morphologies in fetuses of acallosal mouse strains. *Journal of Comparative Neurology, 336,* 595–604.

Parker, S. T., & Gibson, K. R. (1979). A developmental model for the evolution of language and intelligence in early hominids. *Behavioral and Brain Sciences, 2,* 367–408.

Pennisi, E. (2003). Gene counters struggle to get the right answer. *Science, 301,* 1040–1041.

Phillips, R. J. (1960). "Lurcher," a new gene in linkage group XI of the house mouse. *Journal of Genetics, 57,* 35–42.

Phillips, T. J., Belknap, J. K., Hitzemann, R. J., Buck, K. J., Cunningham, C. L., & Crabbe, J. C. (2002). Harnessing the mouse to unravel the genetics of human disease. *Genes, Brain, and Behavior, 1,* 14–26.

Piaget, J. (1952). *The origins of intelligence.* New York: Norton.

Platt, S. A., & Sanislow, C. A. (1988). Norm-of-reaction: Definition and misinterpretation of animal research. *Journal of Comparative Psychology, 102,* 254–261.

Plomin, R. (1986). *Development, genetics and psychology.* Hillsdale, NJ: Erlbaum.

Purves, D. (1994). *Neural activity and the growth of the brain.* New York: Cambridge University Press.

Radell, P. L., & Gottlieb, G. (1992). Developmental intersensory interference: Augmented prenatal sensory experience interferes with auditory learning in duck embryos. *Developmental Psychology, 28,* 795–803.

Rampon, C., Jiang, C. H., Dong, H., Tang, Y.-P., Lockhart, D. J., Schultz, P. G., et al. (2000). Effects of environmental enrichment on gene expression in the brain. *Proceedings of the National Academy of Sciences, USA, 97,* 12880–12884.

Rampon, C., & Tsien, J. Z. (2000). Genetic analysis of learning behavior-induced structural plasticity. *Hippocampus, 10,* 605–609.

Reynolds, G., & Lickliter, R. (2004). Modified prenatal sensory stimulation influences postnatal behavioral and perceptual responsiveness in bobwhite quail chicks. *Journal of Comparative Psychology, 118,* 172–178.

Richardson, K. (1998). *The origins of human potential: Evolution, development, and psychology.* London: Routledge.

Rochat, P., & Senders, S. J. (1991). Active touch in infancy: Action systems in development. In M. J. Weiss & P. R. Zelazo (Eds.), *Infant attention: Biological constraints and the influence of experience* (pp. 412–442). Norwood, NJ: Ablex.

Ronca, A. E., Lamkin, C. A., & Alberts, J. A. (1993). Maternal contributions to sensory experience in the fetal and newborn rat. *Journal of Comparative Psychology, 107,* 1–14.

Rose, S. (1994). From hand to eye: Findings and issues in infant cross-modal transfer. In D. J. Lewkowicz & R. Lickliter (Eds.), *The development of intersensory perception: Comparative perspectives* (pp. 265–284). Hillsdale, NJ: Erlbaum.

Rose, S. (1998). *Lifelines: Biology beyond determinism.* Oxford, England: Oxford University Press.

Rose, S. A., & Ruff, H. A. (1987). Cross-modal abilities in human infants. In J. D. Osofsky (Ed.), *Handbook of infant development* (pp. 318–362). New York: Wiley.

Rosen, K. M., McCormack, M. A., Villa-Komaroff, L., & Mower, G. D. (1992). Brief visual experience induces immediate early gene expression in the cat visual cortex. *Proceedings of the National Academy of Sciences, USA, 89,* 5437–5441.

Roubertoux, P. L., Nosten-Bertrand, M., & Carlier, M. (1990). Additive and interactive effects of genotype and maternal environment. *Advances in the Study of Behavior, 19,* 205–247.

Roubertoux, P. L., Sluyter, F., Carlier, M., Marcet, B., Maarouf-Veray, F., Cherif, C., et al. (2003). Mitochondrial DNA modifies cognition in interaction with the nuclear genome and age in mice. *Nature Genetics, 35,* 65–69.

Roux, W. (1974). Contributions to the developmental mechanics of the embryo. In B. H. Willier & J. M. Oppenheimer (Eds.), *Foundations of experimental embryology* (pp. 2–37). New York: Hafner. (Original manuscript published 1888 in German)

Russell, E. S. (1985). A history of mouse genetics. *Annual Review of Genetics, 19,* 1–28.

Rustak, B., Robertson, H. A., Wisden, W., & Hunt, S. P. (1990). Light pulses that shift rhythms induce gene expression in the suprachiasmatic nucleus. *Science, 248,* 1237–1240.

Saint-Hilaire, E. G. (1825). Sur les deviations organiques provoquées et observées dans un établissement des incubations artificielles. *Mémoires: Museum National d'Histoire Naturelle (Paris), 13,* 289–296.

Salthe, S. N. (1993). *Development and evolution: Complexity and change in biology.* Cambridge, MA: MIT Press.

Sarkar, S. (1999). From the reaktionsnorm to the adaptive norm: The norm of reaction, 1909–1960. *Biology and Philosophy, 14,* 235–252.

Scarr, S. (1992). Developmental theories for the 1990s: Development and individual differences. *Child Development, 63,* 1–19.

Scarr, S. (1993). Biological and cultural diversity: The legacy of Darwin for development. *Child Development, 64,* 1333–1353.

Scarr, S., & McCartney, K. (1983). How people make their own environments: A theory of genotype-environment effects. *Child Development, 54,* 424–435.

Scarr-Salapatek, S. (1976). Genetic determinants of infant development: An overstated case. In L. Lipsitt (Ed.), *Developmental psychobiology: The significance of the infant* (pp. 59–79). Hillsdale, NJ: Erlbaum.

Schiff, M., Duyme, M., Durnaret, A., & Tomkiewicz, S. (1982). How much could we boost scholastic achievement and IQ scores? A direct answer from a French adoption study. *Cognitiori, 12,* 165–196.

Schneirla, T. C. (1956). Interrelationships of the "innate" and the "acquired" in instinctive behavior. In P.-P. Grassé (Ed.), *L'Instinct dans le comportement des animaux de l'homme* (pp. 387–452). Paris: Masson.

Schneirla, T. C. (1957). The concept of development in comparative psychology. In D. B. Harris (Ed.), *The concept of development* (pp. 78–108). Minneapolis: University of Minnesota Press.

Schneirla, T. C. (1959). An evolutionary and developmental theory of biphasic processes underlying approach/withdrawal. In M. Jones (Ed.), *Nebraska Symposium on Motivation* (Vol. 7, pp. 1–42). Lincoln: University of Nebraska Press.

Schneirla, T. C. (1960). Instinctive behavior, maturation-experience and development. In B. Kaplan & S. Wapner (Eds.), *Perspectives in psychological theory-essays in honor of Heinz Werner* (pp. 303–334). New York: International Universities Press.

Schneirla, T. C. (1965). Aspects of stimulation and organization in approach/withdrawal processes underlying vertebrate behavioral development. In D. S. Lehrman, R. Hinde, & E. Shaw (Eds.), *Advances in the study of behavior* (Vol. 1, pp. 2–74). New York: Academic Press.

Scriver, C. R., & Waters, P. J. (1999). Monogenic traits are not simple: Lessons from phenylketonuria. *Trends in Genetics, 15,* 267–272.

Shanahan, M. J., Valsiner, J., & Gottlieb, G. (1997). Developmental concepts across disciplines. In J. Tudge, M. J. Shanahan, & J. Valsiner (Eds.), *Comparative approaches to developmental science* (pp. 34–71). New York: Cambridge University Press.

Shatz, C. (1994). Role for spontaneous neural activity in the patterning of connections between retina and LGN during visual system development. *International Journal of Developmental Neuroscience, 12,* 531–546.

Shillito, E. (1975). A comparison of the role of vision and hearing in lambs finding their own dams. *Applied Animal Ethology, 1,* 369–377.

Smith, L. B., & Katz, B. B. (1996). Activity-dependent processes in perceptual and cognitive development. In R. Gelman & T. K.-F. Au (Eds.), *Handbook of perception and cognition* (2nd ed., pp. 413–445). San Diego, CA: Academic Press.

Sokolowski, M. B. (2001). Drosophila: Genetics meets behaviour. *Nature Reviews Genetics, 2,* 879–890.

Sokolowski, M. B., & Wahlsten, D. (2001). Gene-environment interaction and complex behavior. In H. R. Chin & S. O. Moldin (Eds.), *Methods in genomic neuroscience* (pp. 3–27). Boca Raton, FL: CRC Press.

Soto-Faraco, S., Spence, C., Lloyd, D., & Kingstone, A. (2004). Moving multisensory research along: Motion perception across sensory modalities. *Current Directions in Psychological Science, 13,* 29–32.

Spear, N. E., Kraemer, P. J., Molina, J. C., & Smoller, D. (1988). Developmental change in learning and memory: Infantile disposition for "unitization." In J. Delacour & J. C. Levy (Eds.), *Systems with learning and memory abilities* (pp. 27–52). Amsterdam: Elsevier/North-Holland.

Spear, N. E., & Molina, J. C. (1987). The role of sensory modality in the ontogeny of stimulus selection. In E. M. Blass, M. A. Hofer, & W. M. Srnotherman (Eds.), *Perinatal development: A psychobiological perspective* (pp. 85–110). Orlando, FL: Academic Press.

Spearman, C. (1904). "General intelligence," objectively determined and measured. *American Journal of Psychology, 15,* 201–293.

Spelke, E. S. (1979). Perceiving bimodally specified events in infancy. *Developmental Psychology, 15,* 626–636.

Spelke, E. S. (1981). The infant's acquisition of knowledge of bimodally specified events. *Journal of Experimental Child Psychology, 31,* 279–299.

Sperry, R. W. (1951). Mechanisms of neural maturation. In S. S. Stevens (Ed.), *Handbook of experimental psychology* (pp. 236–280). New York: Wiley.

Sperry, R. W. (1971). How a developing brain gets itself properly wired for adaptive function. In E. Tobach, L. R. Aronson, & E. Shaw (Eds.), *The biopsychology of development* (pp. 28–34). New York: Academic Press.

Spudich, J. L., & Koshland, D. E., Jr. (1976). Nongenetic individuality: Chance in the single cell. *Nature, 262,* 467–471.

Stein, B. E., & Meredith, M. A. (1990). Multisensory integration: Neural and behavioral solutions for dealing with stimuli from different sensory modalities. *Annals of the New York Academy of Sciences, 608,* 51–70.

Stein, B. E., & Meredith, M. A. (1993). *The merging of the senses.* Cambridge, MA: MIT Press.

Stein, B. E., Meredith, M. A., Huneycutt, W. S., & McDade, L. (1989). Behavioral indices of multisensory integration: Orientation to visual cues is affected by auditory stimuli. *Journal of Cognitive Neuroscience, 1,* 12–24.

Stent, G. S. (1981). Strength and weakness of the genetic approach to the development of the nervous system. *Annual Review of Neuroscience, 4,* 163–194.

Stern, W. (1938). *General psychology from the personalistic standpoint.* New York: Macmillan.

Storch, K.-F., Lipan, O., Leykin, I., Viswanathan, N., Davis, F. C., Wong, W. H., et al. (2002). Extensive and divergent circadian gene expression in liver and heart. *Nature, 417,* 78–83.

Streri, A., & Molina, M. (1994). Constraints on intermodal transfer between touch and vision in infancy. In B. J. Lewkowicz & R. Lickliter (Eds.), *The development of intersensory perception: Comparative perspectives* (pp. 285–308). Hillsdale, NJ: Erlbaum.

Strohman, R. C. (1997). The coming Kuhnian revolution in biology. *Nature Biotechnology, 15,* 194–200.

Surwit, R. S., Kuhn, C. M., Cochrane, C., McCubbin, J. A., & Feinglos, M. N. (1988). Diet-induced type II diabetes in C57BL/6J mice. *Diabetes, 37,* 1163–1167.

Symons, L. A., & Tees, R. L. (1990). An examination of the intramodal and intermodal behavioral consequences of long-term vibrissae removal in the rat. *Developmental Psychobiology, 23,* 849–867.

Tanner, L. (2004). Flu during pregnancy linked to schizophrenia in kids. *Globe and Mail,* p. A13.

Taylor, H. F. (1980). *The IQ game: A methodological inquiry into the heredity-environment controversy.* New Brunswick, NJ: Rutgers University Press.

Tecott, L. H. (2003). The genes and brains of mice and men. *American Journal of Psychiatry, 160,* 646–656.

Tees, R. C., & Symons, L. A. (1987). Intersensory coordination and the effects of early sensory deprivation. *Developmental Psychobiology, 20,* 497–508.

Tees, R. L. (1994). Early stimulation history, the cortex, and intersensory functioning in infrahumans: Space and time. In D. J. Lewkowicz & R. Lickliter (Eds.), *The development of intersensory perception: Comparative perspectives* (pp. 107–132). Hillsdale, NJ: Erlbaum.

Tees, R. L., & Buhrmann, K. (1989). Parallel perceptual/cognitive functions in humans and rats: Space and time. *Canadian Journal of Psychology, 43,* 266–285.

Thelen, E., Schöener, G., Scheier, C., & Smith, L. B. (2001). The dynamics of embodiment: A field theory of infant perserverative reaching. *Behavioral and Brain Sciences, 24,* 1–86.

Thelen, E., & Smith, L. B. (1994). *A dynamic systems approach to the development of cognition and action.* Cambridge, MA: MIT Press.

Thelen, E., & Ulrich, B. O. (1991). Hidden skills: A dynamic systems analysis of treadmill stepping during the first year. *Monographs of the Society for Research in Child Development, 56*(Serial No. 223).

Thomas, S. A., & Palmiter, R. D. (1997). Disruption of the dopamine-ß-hydroxylase gene in mice suggests roles for norepinephrine in motor function, learning, and memory. *Behavioral Neuroscience, 111,* 579–589.

Tiret, L., Abel, L., & Rakotovao, R. (1993). Effect of ignoring genotype-environment interaction on segregation analysis of quantitative traits. *Genetic Epidemiology, 10,* 581–586.

Tolman, E. C. (1932). *Purposive behavior in animals and man.* New York: Century.

Turkewitz, G. (1994). Sources of order for intersensory functioning. In D. J. Lewkowicz & R. Lickliter (Eds.), *The development of intersensory perception: Comparative perspectives* (pp. 3–18). Hillsdale, NJ: Erlbaum.

Turkewitz, G., & Kenny, P. (1982). Limitations on input as a basis for neural organization and perceptual development: A preliminary theoretical statement. *Developmental Psychobiology, 15,* 357–368.

Turkewitz, G., & Mellon, R. C. (1989). Dynamic organization of intersensory function. *Canadian Journal of Psychology, 43,* 286–307.

van der Veer, R., & Valsiner, J. (1991). *Understanding Vygotsky: A quest for synthesis.* Oxford, England: Blackwell.

van der Weele, C. (1995). *Images of development: Environmental causes in ontogeny.* Veije University, Amsterdam, The Netherlands.

Varela, F. J., Thompson, E., & Rosch, E. (1991). *The embodied mind: Cognitive science and human experience.* Cambridge, MA: MIT Press.

von Baer, K. E. (1828). *Uber entwickelungsgeschichte der thiere: Pt. 1. Beobachtung und Reflexion.* Konigsberg, Germany: Borntrager.

von Bertalanffy, L. (1950). *A systems view of man.* Boulder, CO: Western Press.

von Bertalanffy, L. (1962). *Modern theories of development: An introduction to theoretical biology.* New York: Harper. (Original work published 1933 in German).

Wachs, T. D. (1992). *The nature of nurture.* Newbury Park: Sage.

Waddington, C. H. (1957). *The strategy of the genes.* London: Allen & Unwin.

Wahlsten, D. (1979). A critique of the concepts of heritability and heredity in behavioral genetics. In J. R. Royce & L. Mos (Eds.), *Theoretical advances in behavior genetics* (pp. 425–470). Germantown, MD: Sijthoff & Noordhoff.

Wahlsten, D. (1982). Mice in utero while their mother is lactating suffer increased frequency of absent corpus callosum. *Developmental Brain Research, 5,* 354–357.

Wahlsten, D. (1983). Maternal effects on mouse brain weight. *Developmental Brain Research, 9,* 215–221.

Wahlsten, D. (1989). Deficiency of the corpus callosum: Incomplete penetrance and substrain differentiation in BALB/c mice. *Journal of Neurogenetics, 5,* 61–76.

Wahlsten, D. (1990). Insensitivity of the analysis of variance to heredity-environment interaction. *Behavioral and Brain Sciences, 13,* 109–161.

Wahlsten, D. (1991). Sample size to detect a planned contrast and a one degree-of-freedom interaction effect. *Psychological Bulletin, 110,* 587–595.

Wahlsten, D. (1994). The intelligence of heritability. *Canadian Psychology, 35,* 244–260.

Wahlsten, D. (1999a). Experimental design and statistical inference. In W. E. Crusio & R. T. Gerlai (Eds.), *Handbook of molecular-genetic techniques for behavioral neuroscience* (pp. 40–57). Amsterdam: Elsevier.

Wahlsten, D. (1999b). Single-gene influences on brain and behavior. *Annual Review of Psychology, 50,* 599–624.

Wahlsten, D., Bishop, K. M., & Ozaki, H. (in press). Recombinant inbreeding in mice reveals thresholds in embryonic corpus callosum development. *Brain and Behavior.*

Wahlsten, D., Metten, P., & Crabbe, J. C. (2003). Survey of 21 inbred mouse strains in two laboratories reveals that BTBR T/+ *tf/tf* has severely reduced hippocampal commissure and absent corpus callosum. *Brain Research, 971,* 47–54.

Wahlsten, D., Metten, P., Phillips, T. J., Boehm, S. L., II, Burkhart-Kasch, S., Dorow, J., et al. (2003). Different data from different labs: Lessons from studies of gene-environment interaction. *Journal of Neurobiology, 54,* 283–311.

Wahlsten, D., & Wainwright, P. (1977). Application of a morphological time scale to hereditary differences in prenatal mouse development. *Journal of Embryology and Experimental Morphology, 74,* 133–149.

Walker-Andrews, A. S. (1994). Taxonomy for intermodal relations. In B. J. Lewkowicz & R. Lickliter (Eds.), *The development of intersensory perception: Comparative perspectives* (pp. 39–56). Hillsdale, NJ: Erlbaum.

Walker-Andrews, A. S. (1997). Infants' perception of expressive behavior: Differentiation of multimodal information. *Psychological Bulletin, 121,* 437–456.

Walker-Andrews, A. S., Bahrick, L. E., Raglioni, S. S., & Diaz, I. (1991). Infants' bimodal perception of gender. *Ecological Psychology, 3,* 55–75.

Wallace, D. C., Singh, G., Lott, M. T., Hodge, J. A., Schurr, T. G., Lezza, A. M. S., et al. (1988). Mitochondrial DNA mutation associated with Leber's hereditary optic neuropathy. *Science, 242,* 1427–1430.

Weismann, A. (1894). *The effect of external influences upon development.* London: Henry Frowde.

Weiss, P. (1959). Cellular dynamics. *Review of Modern Physics, 31,* 11–20.

Welch, R. B., & Warren, D. H. (1986). Intersensory interactions. In K. R. Boff, L. Kaufman, & J. P. Thomas (Eds.), *Handbook of perception and human performance* (pp. 1–36). New York: Wiley.

West, M. J., & King, A. P. (1987). Settling nature and nurture into an ontogenetic niche. *Developmental Psychobiology, 20,* 549–562.

Whitelaw, E., & Martin, D. I. K. (2001). Retrotransposons as epigenetic mediators of phenotypic variation in mammals. *Nature Genetics, 27,* 361–365.

Wilmington, D., Gray, L., & Jahrsdoerfer, R. (1994). Binaural processing after corrected congenital unilateral conductive hearing loss. *Hearing Research, 74,* 99–114.

Wilson, R. S. (1983). Human behavioral development and genetics. *Acta Geneticae Medicae et Gemellologiae, 32,* 1–16.

Wolfer, D. P., Crusio, W. E., & Lipp, H. P. (2002). Knockout mice: Simple solutions to the problems of genetic background and flanking genes. *Trends in Neurosciences, 25,* 336–340.

Wong, A. H. C., Buckle, C. E., & Van Tol, H. H. M. (2000). Polymorphisms in dopamine receptors: What do they tell us? *European Journal of Pharmacology, 410,* 183–203.

Wright, S. (1968). *Evolution and the genetics of population: Vol. 1. Genetic and biometric foundations.* Chicago: University of Chicago Press.

Wynshaw-Boris, A., Garrett, L., Chen, A., & Barlow, C. (1999). Embryonic stem cells and gene targeting. In W. E. Crusio & R. T. Gerlai (Eds.), *Handbook of molecular-genetic techniques for brain and behavior research* (pp. 259–271). Amsterdam: Elsevier Science.

Zhang, Y., Proenca, R., Maffei, M., Barone, M., Leopold, L., & Friedman, J. M. (1994). Positional cloning of the mouse obese gene and its human homologue. *Nature, 372,* 425–432.

Zukow-Goldring, P. (1997). A social ecological realist approach to the emergence of the lexicon: Educating attention to amodal invariants in gesture and speech. In C. Dent-Reed & P. Zukow-Goldring (Eds.), *Evolving explanations of development* (pp. 199–250). Washington, DC: American Psychological Association.

CHAPTER 6

Dynamic Systems Theories

ESTHER THELEN and LINDA B. SMITH

DYNAMIC SYSTEMS THEORIES 258
Intellectual Heritage: Developmental Process 259
Lessons from Embryology: Form from a Formless Egg 260
The Mountain Stream Metaphor 263
Epigenesis in Developmental Psychobiology 263
Contextual and Ecological Theorists 266
An Introduction to Dynamics Systems Thinking 271
Development from a Dynamic Systems Perspective 276
Bimanual Coordination 297
What Is Skill? 298
SUMMARY 307
CONCLUSION: WHY DYNAMICS? 307
REFERENCES 308

Dynamic systems is a recent theoretical approach to the study of development. In its contemporary formulation, the theory grows directly from advances in understanding complex and nonlinear systems in physics and mathematics, but it also follows a long and rich tradition of systems thinking in biology and psychology. The term *dynamic systems,* in its most generic form, means systems of elements that change over time. The more technical use, *dynamical systems,* refers to a class of mathematical equations that describe time-based systems with particular properties.

DYNAMIC SYSTEMS THEORIES

In this chapter, we present a theory of development based on very general and content-independent principles that describe the behavior of complex physical and biological systems. The application of dynamic systems to development process is relatively new, emerging in the past 20 years. However, in many ways it is a modern continuation of a long tradition; accordingly, this chapter begins with a brief historical review of two strands that form the intellectual heritage for dynamic systems theories: theories (and empirical studies) of developmental process and general systems theories. We present a tutorial of dynamic systems principles and show how they may be used to yield a deeper understanding of the processes of change. We show how these ideas can be used to help us understand developmental process as: (a) a conceptual guide, (b) a program for research, and (c) a basis for formal theory. Finally, we consider the relation between dynamical systems approaches to development and other theories of development.

Throughout the presentation, both in the historical heritage of studying developmental process and in dynamics systems theory itself, two themes will recur:

1. Development can only be understood as the multiple, mutual, and continuous interaction of all the levels of the developing system, from the molecular to the cultural.
2. Development can only be understood as nested processes that unfold over many timescales from milliseconds to years.

The value of dynamic systems is that it provides theoretical principles for conceptualizing, operationalizing, and formalizing these complex interrelations of time, substance, and process. It is a metatheory in the sense that it may be (and has been) applied to different species,

ages, domains, and grains of analysis. But it is also a specific theory of how humans gain knowledge from their everyday actions (e.g., Thelen & Smith, 1994).

Intellectual Heritage: Developmental Process

> [T]he induction of novel behavioral forms may be the single most important unresolved problem for all the developmental sciences. (Wolff, 1987, p. 240)

What do we mean when we say that an organism "develops"? Usually, we say that it gets bigger, but always we mean that it gets more complex. Indeed, the defining property of development is the creation of new forms. A single cell and then a mass of identical cells are starting points for legs, livers, brains, and hands. The 3-month-old infant who stops tracking a moving object when it goes out of sight becomes an 8-year-old child who can read a map and understand symbolically represented locations, and, later, an 18-year-old student who can understand and even create formal theories of space and geometry. Each of these transitions involves the emergency of new patterns of behavior from precursors that themselves do not contain those patterns. Where does this novelty come from? How can developing systems create something from nothing?

Understanding the origins of this increasing complexity is at the heart of developmental science. Traditionally, developmentalists have looked for the sources of new forms either in the organism or in the environment. In the organism, complex structures and functions emerge because the complexity exists in the organism in the form of a neural or genetic code. Development consists of waiting until these stored instructions tell the organism what to do. Alternatively, the organism gains new form by absorbing the structure and patterning of its physical or social environment through interactions with that environment. In the more commonly accepted version, the two processes both contribute: Organisms become complex through a combination of nature and nurture. For instance, the guiding assumption of developmental behavior genetics is that the sources of complexity can be partitioned into those that are inherent, inherited, and absorbed from the environment. But whether development is viewed as driven by innate structures, environmental input, or a combination of the two, the fundamental premise in the traditional view is that "information can preexist the processes that give rise to it" (Oyama, 1985, p. 13).

But if the instructions to develop are in the genes, who turns on the genes? If the complexity exists in the environment, who decides what the organism should absorb and retain? The only way to answer these questions is to invoke yet another causal agent who evaluates the information, whether genetic or environmental, and makes decisions. Some clever homunculus must be orchestrating a developmental score while knowing how it must all turn out in the end. This is a logically indefensible position; it says that novelty really does not develop, it is there all along. Postulating an interaction of genes and environment does not remove this logical impasse. It merely assigns the preexisting plans to two sources instead of one.

In this chapter, we follow a different tradition. We agree with Wolff (1987) that the question of novel forms is the great unanswered question. And we also concur that the traditional solutions—nature, nurture, or interaction of both—are sufficient. The tradition we follow, that of *systems theories of biological organization,* explains the formation of new forms by processes of *self-organization.* By self-organization we mean that *pattern and order emerge from the interactions of the components of a complex system without explicit instructions,* either in the organism itself or from the environment. Self-organization—processes that by their own activities change themselves—is a fundamental property of living things. Form is constructed during developmental process (Gottlieb, Wahlsten, & Lickliter, Chapter 5, this *Handbook,* this volume; Oyama, 1985).

Dynamic systems offers general principles for formalizing ideas of biological self-organization in ways that are extraordinarily useful for understanding developmental process and for conducting experimental research. In this chapter, we apply these principles most specifically to perceptual, motor, and cognitive development in infants and early childhood (e.g., Jones & Smith, 1993; Thelen, 1989; Thelen & Smith, 1994; Thelen & Ulrich, 1991). But the theme of the developing organism as a holistic, self-organizing system has appeared many times before in biology and psychology. Before we describe and apply dynamic principles, we situate our systems theory in the wider perspective of systems thinking in development. Toward this goal, our review is selective and thematic, rather than exhaustive. Readers are referred to excellent reviews by Ford and Lerner (1992), Gottlieb (1992), Gottlieb et al. (Chapter 5, this *Handbook,* this volume), Oyama (1985), and Sameroff (1983).

Lessons from Embryology: Form from a Formless Egg

A baby's first step or first word is a dramatic example of new behavioral form. But no example of developmental novelty is as compelling as the emergency of an embryo from the initial state of a seemingly homogeneous and formless single cell, the fertilized egg. And no other aspect of development seems so completely "genetic" in the strict unfolding of species-typical structure.

For well over a century, biologists have studied this transformation of a single sphere into an intricate, three-dimensional organism with beautifully formed organs and well-differentiated tissue types. During the past few decades, however, researchers have made significant advances toward understanding the "impenetrable black box" (Marx, 1984a, p. 425) of this developmental process.

What is now abundantly clear is that embryonic development is an intricate dance between events in the nucleus—the turning off and on of particular gene products—and what one writer has deemed "mundane" biophysical principles in the cell body and surface (Marx, 1984b, p. 1406). Consider how animals get their basic body plans—the specific parts and organs that emerge in orderly time and space dimensions in the first days and weeks of life. Formation of the body pattern occurs when the fertilized egg has divided to about 10,000 cells. By this time, although the cells look like an undifferentiated heap, they are already marked in positions that predict distinct body locations. They have become a founder group of cells.

It is now well established that what appeared to be a homogenous founder cell or group of cells actually contains various and subtle gradients of substances, which form a very general "prepattern" of the structure that will emerge (Wolpert, 1971). These gradients and patterns, in turn, often arise from the "mundane" effects of gravity, the mechanical effects of molecular structure in the cell and at its surface (the pushing and pulling of particular molecules and crystals), or the regulated amplification of small local fluctuations in physiology or metabolism (Cooke, 1988; Gierer, 1981). Even more remarkable, is that once some initial prepattern is formed, the regulating genes in the nucleus are themselves switched on and off by these changing physical and mechanical events outside of the nucleus. Thus, once the initial generalized body fates are determined, the course of more refined tissue and organ differentiation is equally bidirectional between nuclear processes and other cellular events.

During embryogenesis, cells divide, change character, move, and organize themselves into larger collectives of tissues, organs, and organ systems. The process is highly dynamic; that is, the cell and tissue movements themselves are sources of order and complexity. As groups of cells arising from different local gradients move and come into contact, their new positions further change their character, a process known as *induction.* What is especially relevant to our account here is that no single cell itself gives the signal that this region will become a neural tube or limb bud. Rather, it is the group of cells, acting as a collective and within a particular position in the larger collective that determines their ultimate fate. No one cell is critical, but the history and spatial and temporal dimensions of the collective are. Development is constructed through process:

> The pathways of induction and determination involve a historical series of milieu-dependent gene expressions that are coupled to those mechanical and mechanochemical events that actually govern the achievement of form and pattern. At any one time, there is interplay between the place, scale, and size of bordering collectives, and various inductive molecular signals not only maintain the pattern so far established but also transform it into a new pattern. (Edelman, 1988, p. 26)

This picture is much different from one that casts the genes as the puppeteer, pulling the right strings at the right time to control the ensuing events in the cells. In a dynamic view, we consider the marionette and the puppeteer as affecting each other equally. Or, more accurately, we do away with the puppeteer and the marionette altogether: *What is important is the relationships among the strings as they pull and then become slack.*

Embryologists have been among the pioneers in using dynamic systems both formally and metaphorically to model developmental processes. Most notable was the preeminent developmental biologist C. H. Waddington. Waddington's primary interest was the genetic influence on tissue differentiation in the embryo, the emergence of sharply distinctive tissue types—bones, muscles, lungs, and so on—from a single cell. Although a geneticist, he was also a thoroughgoing systems theorist. Waddington (1954) couched developmental process in explicitly dynamic terms: "We can still consider development in terms of the solutions of a system of simulta-

neous differential equations" (p. 238). Especially in his later writings, Waddington described embryonic change in the language of attractors, bifurcations, open systems, stability, catastrophes, and chaos (Waddington, 1977). Figure 6.1 is one of his depictions, in three dimensions, of the multidimensional space subdivided into a number of regions, such that trajectories starting anywhere in one region converge to one certain end point, while those starting in other regions converge elsewhere (Waddington, 1957, p. 28). The figure shows how the gradients established in the egg, through time-dependent processes, become stable, differentiated tissue types. Waddington was especially intrigued by the self-stabilizing nature of development, depicted on his now classic "epigenetic landscape" shown in Figure 6.2. The landscape represents a developing system, where time runs toward the reader, and where the depth of the valleys is an indication of stability (the ball, once in a valley, is hard to dislodge). From an initial undifferentiated state (the ball could be anywhere on the landscape), development creates hillocks and valleys of increasing complexity. As development proceeds, the tissue types become separated by higher hills, signifying the irreversible nature of development. However, the pathways down the landscape also show buffering; that is, development proceeds in globally similar ways despite somewhat different initial conditions, and despite minor perturbations or fluctuations along the way. In his last book, published posthumously in 1977, Waddington called the epigenetic landscape an "attractor landscape" (p. 105). He asked, "How do we find out the shape of the landscape?" He suggested: "So what we should try to do is to alter it, slightly, in as many ways as possible and observe its reactions. We will find that the system resists some types of changes more than others, or restores itself more quickly after changes in some directions than in others" (Waddington, 1977, p. 113). Similarly, in our version of a dynamic systems account, probing the system's stability is also a critical step.

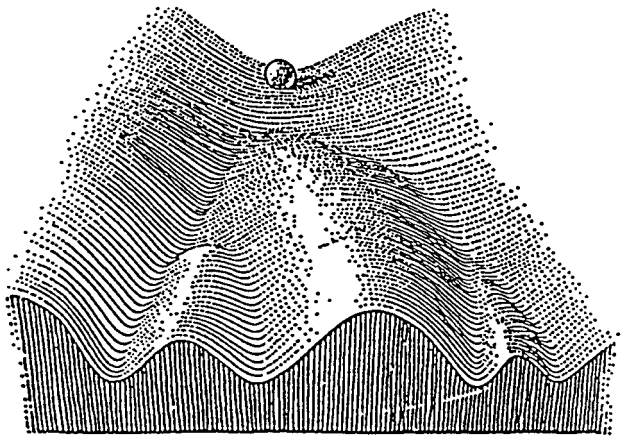


Figure 6.2 Waddington's classic epigenetic landscape. The path of the ball is the developmental history of part of the egg, showing the increasing stability of the developing tissue types. *Source:* From *The Strategy of the Genes: A Discussion of Some Aspects of Theoretical Biology* (p. 29), by C. H. Waddington, 1957, London: Allen & Unwin. Copyright 1957 by Allen & Unwin. Reprinted with permission of Mrs. M. J. Waddington.

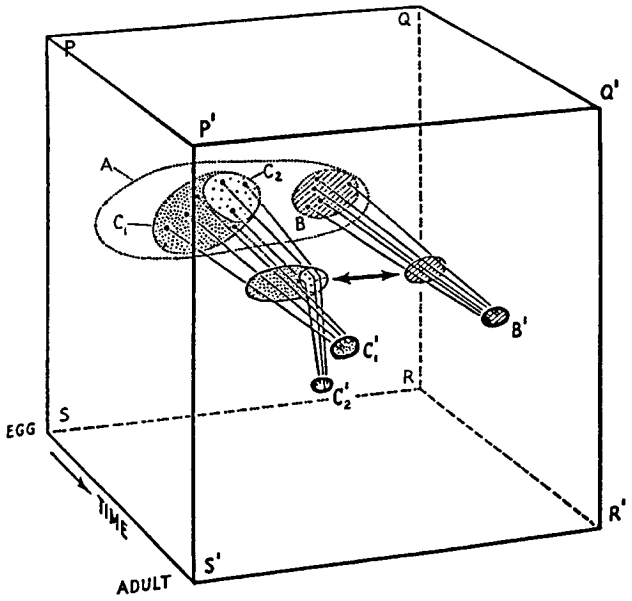


Figure 6.1 Waddington's phase-space diagram of development. Time runs along the z-axis, from plane PQRS at the time of fertilization to P′Q′R′S′ which is adulthood. The other two dimensions represent the composition of the system. The diagram shows how the egg, which has continuous composition gradients becomes differentiated into specific tissues. Some areas in the state space act as attractors, pulling in nearby trajectories. *Source:* From *The Strategy of the Genes: A Discussion of Some Aspects of Theoretical Biology* (p. 28), by C. H. Waddington, 1957, London: Allen & Unwin. Copyright 1957 by Allen & Unwin. Reprinted with permission of Mrs. M. J. Waddington.

Since Waddington, theorists and mathematicians have offered numerous dynamic models of morphogenesis, the emergency of form (see, e.g., Gierer, 1981; Goodwin & Cohen, 1969; Meakin, 1986; Tapaswi & Saha, 1986; Thom, 1983; Yates & Pate, 1989, among others). The common features of these models are initial conditions consisting of very shallow gradients, differential mechanical factors such as pressures or adhesions

in the cells, or both. The gradient or force fields are represented by one of several classes of differential equations, which express change as a function of time. Some sets of equations involve lateral inhibition, which allows a small local activation to become enhanced and form the node of a pattern. When the equations are solved for variety of parameters, complex spatial patterns are generated, which may consist of cycles, multiple peaks and valleys, and even fractals (complex scale-independent patterns). Combining two or more gradients with different rates of change and coupling their interactions can lead to highly complex patterns, including stripes, columns, and so on: "[V]ery complex real patterns may arise on the basis of elementary field-forming mechanisms and their combinations" (Gierer, 1981, p. 15).

One of the most delightful and fanciful of these models of pattern formation is that of the mathematician J. D. Murray, who provides an elegant model of the ontogeny of mammalian coat patterns: "How the leopard got its spots" (Murray, 1988, 1993). Think about your last visit to the zoo and the remarkable range of coat markings you saw: The complex spots and stripes of zebras, leopards, and giraffes; the simpler stripes of skunks and badgers; and the softly shaded patterns of some ungulates. Murray shows how a *single* mechanism, modeled by a simple nonlinear equation of the developmental process, can account for all the variations in coat markings. The equation is of the reaction-diffusion type, where an initial gradient of some chemical (the morphogen) can take on particular rates of reaction combined with varying rates of diffusion in a close surface. The interactions between the chemical reaction and its rate of diffusion are highly nonlinear, meaning that sometimes the reaction proceeds in a stable manner, but, at other values, the reaction is unstable and no pigment is formed. This nonlinearity leads to either a smooth or a patch-like pattern of reaction products on the surface. Critical factors include the reaction rates; when the process is started, presumably under genetic control; and then, only the geometry and scale of the initial gradient is believed to be some substance that activates melanin (pigment) production in melanocyte cells in the skin surface during early embryogenesis.

The power of Murray's simple model is illustrated in Figure 6.3, which shows the results of the simulations of the equation with set parameters, changing only the scale of surface of the body over which the chemical

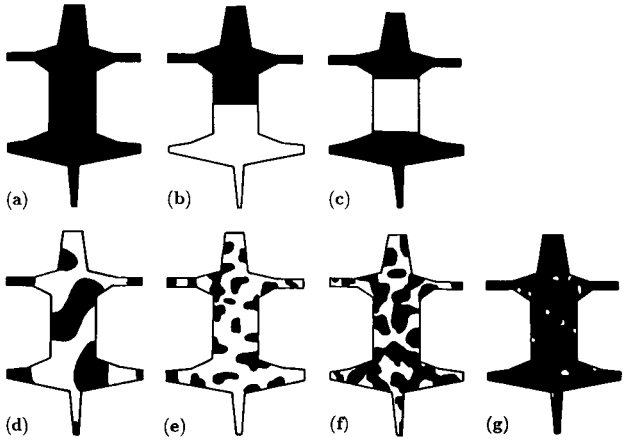


Figure 6.3 The effect of body surface scale on the patterns formed by a reaction diffusion mechanisms for mammalian coat coloration. A single mechanism can account for diverse coat patterns, depending on the parameter values in the equations. *Source:* From *Mathematical biology* (2nd ed., p. 445), by J. D. Murray, 1993, Berlin, Germany: Springer-Verlag. Copyright 1993 by Springer-Verlag. Reprinted with permission.

dynamics occur. As the body is scaled up over 50,000 times (presumably, from a mouse to an elephant), a regular series of patterns emerges: The solid color of very small animals, then the simple bifurcations and the more elaborate spottings, and, again, the nearly uniform coat of large animals. (Indeed, very small and very large mammals are more likely to have solid coats.) In real animals, small random variations in the initial gradient would lead to the noticeable individual variations in coat pattern. The important fact is that the *dynamics* of the reactions create the pattern.

Embryologists and theoreticians of morphogenesis show how, during development, extraordinarily complex structural patterns can arise from very simple initial conditions in dynamic systems. The patterns that result are not specifically coded in the genes. Although all leopards are spotted and all raccoons have striped tails, there is no dedicated gene for spots on the leopard or striped tails for raccoons. Structural complexity is constructed during development because living systems with particular chemical and metabolic constraints spontaneously organize themselves into patterns. In such systems, the issue of "what causes what to happen" is particularly thorny. When all parts of the system cooperate, when a group of cells only takes on a particular fate in the context of its position among other cells, it is simply not feasible to ask whether this structure or this behavior is "caused" by genes or by

environment. Through experimentation and modeling, the efforts of embryologists are directed toward a deep and detailed understanding of process.

The implications of embryology for theories of psychological development are profound. Often we find ourselves searching for the "cause" of development, or the essential structure that makes some behavior—language, walking, number concepts—what it is. Thus, much developmental research has been directed toward discovering invariants—the programs, stages, structures, representations, devices, schemas, or modules—that underlie performance at different ages. A good part of this search is directed toward which invariants are "innate" (present at birth), which are "genetic" (hard-wired into the system by natural selection), and which, by analogy to genes, "determine" developmental outcome (e.g., Gelman & Gallistel, 1978; Spelke, Breinlinger, Macomber, & Jacobson, 1992). But embryology teaches us that the genes do not—in and of themselves—determine developmental outcome. Genes are essential elements in a dynamic cascade of processes. Understanding the development means understanding that cascade.

The Mountain Stream Metaphor

The larger lesson from embryology for psychology is this: the stable regularities we see in developed organisms—the phenomena we seek as psychologists to explain—might not have specific causes that can be demarcated and isolated but rather may be understood only as a dynamic cascade of many processes operating over time. This idea challenges the usual notions of science that we understand by analysis, by isolating *things*—ingredients and components—until we arrive at the essential *stuff*. Explanations in terms of complex and cascading processes as opposed to explanations in terms of a list of parts is difficult even for scientists (see Chi, Slotta, & de Leeuw, 1994). Accordingly, we offer a metaphor that may seem at first far afield, but we hope that thinking about it explains process as the cause of structure.

The metaphor is of a fast-moving mountain steam. At some places, the water flows smoothly in small ripples. Nearby may be a small whirlpool or a large turbulent eddy. Still other places may show waves or spray. These patterns persist hour after hour and even day after day, but after a storm or a long dry spell, new patterns may appear. Where do they come from? Why do they persist and why do they change?

No one would assign any geological plan or grand hydraulic design to the patterns in a mountain stream. Rather, the regularities patently emerge from multiple factors: The rate of flow of the water downstream, the configuration of the stream bed, the current weather conditions that determine evaporation rate and rainfall, and the important quality of water molecules under particular constraints to self-organize into different patterns of flow. But what we see in the here-and-now is just part of the picture. The particular patterns evident are also produced by unseen constraints, acting over many different scales of time. The geological history of the mountains determined the incline of the stream bed and the erosion of the rocks. The long-range climate of the region led to particular vegetation on the mountain and the consequent patterns of water absorption and runoff. The climate during the past year or two affected the snow on the mountain and the rate of melting. The configuration of the mountain just upstream influenced the flow rate downstream. And so on. Moreover, we can see the relative importance of these constraints in maintaining a stable pattern. If a small rock falls into a pool, nothing may change. As falling rocks get larger and larger, at some point, the stream may split into two, or create a new, faster channel. What endures and what changes?

Process accounts assume that behavior patterns and mental activity can be understood in the same terms as the eddies and ripples of a mountain stream. They exist in the here-and-now, and they may be very stable or easily changed. Behavior is the product of multiple, contributing influences, each of which itself has a history. But just as we cannot really disentangle the geologic history of the mountain from the current configuration of the stream bed, we also cannot draw a line between the real-time behavior and the lifetime processes that contribute to it. Likewise, there is no separation of the patterns themselves from some abstraction of those patterns.

The mountain stream metaphor depicts behavioral development as an *epigenetic process;* that is, truly constructed by its own history and system-wide activity. This is a venerable idea with a long history in developmental theorizing.

Epigenesis in Developmental Psychobiology

No one understood a systems approach more deeply than a group of developmental psychobiologists working largely in the 1940s, 1950s, and 1960s, especially T. C.

Schneirla, Daniel Lehrman, and Zing-Yang Kuo, whose tradition is carried on today most eloquently by Gilbert Gottlieb (Gottlieb et al., Chapter 5, this *Handbook,* this volume). These biologists used the word *epigenesist* to describe the process of behavioral ontogeny (see Kitchener, 1978, for discussion of the various meanings of the term *epigenesist*). Their vision is best understood as a contrast with the prevailing scientific thought about behavior and its change, and, in particular, the recurrent issue of nature versus nurture.

In those decades, North American psychology was dominated by learning theorists. As is well known, the goal of these experimental psychologists was to elucidate the general laws of behavior as animals are shaped by experience. Behaviorists used a variety of experimental animals such as rats and pigeons, but they believed that the principle of training and reinforcement applied to all species, including humans. Development, according to behaviorist theories, consists of the animal's reinforcement history. The radical environmentalism of behaviorists is captured in a statement from a critical essay by Lehrman (1971):

> Also basic to what I here call the "behaviorist orientation" is the idea that scientific explanations of, and statements of scientific insights into, behavior *consist* of statements about how the experimenter gains control over the behavior, or about how the actions of the subject can be predicted by the actions of the experimenter. (p. 462)

Although learning continues to be an important aspect of developmental accounts, especially in explaining the socialization of children (Bandura, 1977), learning theories have lost favor as general developmental theories. In part, this is due to their inability to explain species differences and to provide satisfactory accounts of cognitive and language development. Equally troubling is that learning alone does not tell us how novelty arises.

In the 1950s and 1960s, a view of behavior became popular that strongly opposed pure learning theories. *Ethological theories* came from the European school associated with Konrad Lorenz and his students. Lorenz's work was seminal in reorienting psychologists to the role of species-typical behavior and animals' adaptations to their environments. And although ethologists such as Lorenz considered learning to be important, learning always was placed alongside behavior deemed innate or instinctive. According to Lorenz (1965), that distinction between innate and learned was of primary importance in understanding behavior and its development. Indeed, Lorenz believed that behavior could be broken up into elements that were wholly innate and elements that were learned, although the focus of ethologists' studies was most often on the innate parts. The form of a behavior—for example, particular courtship calls or displays, or, in humans, facial expressions—was believed to be "hardwired" and not acquired. Lorenz called this class of movements "fixed action patterns" because they were believed to emerge without specific experience. The object and orientation of these displays may be learned during ontogeny. Geese, for instance, instinctively follow objects on which they become imprinted, but they learned to follow Lorenz instead, if he substituted himself for the mother goose at the appropriate time.

The epigeneticists, in contrast to both learning theorists and ethologists, campaigned to eliminate altogether the question of learned versus acquired. They were especially critical of what they considered the vague and ill-defined meaning of such terms as *innate* or *instinctive.* Lehrman's statement in 1953 is as eloquent and relevant today as then:

> The "instinct" is obviously not present in the zygote. Just as obviously, it is present in the behavior of the animal after the appropriate age. The problem for the investigator is: How did this behavior come about? The use of explanatory categories such as "innate" and "genetically fixed" obscures the necessity of investigating developmental *processes* to gain insight into actual mechanisms of behavior and their interrelations. The problem of development is the problem of the development of new *structures* and activity *patterns* from the resolution of the interaction of existing ones in the organism and its internal environment, and between the organism and its outer environment. (p. 338)

In his book, *The Dynamics of Behavior Development: An Epigenetic View,* Kuo (1967) presented a particularly clear statement of developmental process from a systems view. Kuo emphasized that behavior is complex and variable and takes place in a continually changing internal and external environment. The behavior we observe is an integral part of the total response of the animal to the environment, but there are differentiations—or patterned gradients—of response among different parts of the body. He wrote:

> Ontogenesis of behavior is a process of modification, transformation, or reorganization of the existing patterns of behavior gradients in response to the impact of new en-

> vironmental stimulation; and in consequence a new spatial and/or serial pattern of behavior gradients is formed, permanently or temporarily ("learning") which oftentimes adds to the inventory of the existing patterns of behavior gradients previously accumulated during the animal's developmental history. (Kuo, 1970, p. 189)

During the life span, new patterns are selected from among the range of potential patterns:

> Thus, in every stage of ontogenesis, every response is determined not only by the stimuli or stimulating objects, but also by the total environmental context, the status of anatomical structures and their functional capacities, the physiological (biochemical and biophysical) condition, and the developmental history up to that stage. (Kuo, 1970, p. 189)

In his call for an integrated developmental science, Kuo (1970) exhorted scientists to study "every event that takes place under and outside the skin" as part of the behavioral gradient, and not to look just at global measures of organism or environment: "[W]e must take quantitative measures of stimulative effects of every sensory modality, and make qualitative analyses of the interactions of the component parts of the environmental context or complex" (p. 190). Kuo's extraordinary vision, fashioned from his work as both an embryologist and a comparative psychologist, did not have a direct influence on the mainstream of child psychology, which became enraptured with Piaget (1952) at that time, and later with Bowlby (1969) and attachment theory. Nonetheless, a broad systems view has continued with a group of comparative developmental psychobiologists who have conducted exquisite and detailed studies of the intricate interrelated mechanisms of offspring, parents, and environment in early life. These include Gilbert Gottlieb, Jay Rosenblatt, Lester Aronson, Ethel Tobach, Howard Moltz, William Hall, Jeffrey Alberts, Patrick Bateson, Meredith West, and others. Gerald Turkewitz has been a pioneer in continuing the Schneirla-Kuo tradition in human infancy studies.

One hallmark of this comparative work is minute and detailed understanding of the experiential context of the developing organism, including factors that are not necessarily the apparent and obvious precursors to a particular behavior, but may indeed be critical contributors. "Experience may contribute to ontogeny in subtle ways," Schneirla wrote (1957, p. 90), and also in ways that are nonspecific. Small effects of temperature, light, and gravity, at critical times, for instance, can cascade into large developmental differences. Nonobvious and nonspecific factors are important considerations in a dynamic systems view as well.

A beautiful example of developmental analysis in the systems tradition of Schneirla and Kuo is the work of Meredith West and Andrew King on the ontogeny of bird song. West and King's studies on song learning in the cowbird, a brood parasite, have uncovered subtleties and variations in the developmental process that raise questions about a more simplistic earlier view: Song learning was either directed by an innate template or learned by imitation of other singing males. First, they found an overwhelming effect of context on both the learning and the performing of songs—for example, males' being housed with females during rearing affected their song content. Even though females do not sing, they exert social influence on males that are strong enough to override any specific sensory template (King & West, 1988). The mechanism appears to be females' selective responses (by brief wing-flicking movements) during the time when males are learning song. The female cowbird helps shape the male song by her response. Furthermore, experience with cowbird females is essential for appropriate male mating behavior. When male cowbirds were raised with canaries, they sang to and pursued canaries rather than females of their own species. But this preference was not a rigid imprinting, as the old ethologists would have maintained. When these canary-housed cowbird males were housed with cowbird females in their second season, they reversed their preference.

From this and other evidence, West and King conclude that song development is highly multiply determined and dynamic in the sense of being continually constructed in time and space. An animal's species-typical environment of rearing and its own actions in that environment are as "inevitable [a] source of influence as are an animal's genes" (West & King, 1996). And because these dynamic processes are so interactive and nonlinear, fundamental properties disappear when they are disrupted. For example, experimental perturbations to the expected rearing conditions, such as placing animals in isolation or injecting them with hormones, may have both dramatic and subtle cascading effects. Such manipulations often illuminate the interactions in the system, but they must be interpreted with great care. These insights raise cautions about interpretations of experiments with infants and children because the interaction between the experimental manipulation and the

normal, everyday experiences of the subjects are often unknown. A dynamic systems approach suggests that these contextual factors and their time functions are the critical aspects of performance and development.

Recent research by Goldstein and West (1999; Goldstein, King, & West, 2003) strongly illustrates this point. This work concentrates on the development from the sounds children make *prior to language* to those that may be considered *speech* sounds. Prelinguistic vocal development or "babbling," long thought to be driven exclusively by articulator maturation (e.g., Kent, 1981), takes on new significance when studied from a dynamic systems perspective. When caregivers and infants are studied together as they interact in real time, vocal development shows multicausality and interdependency of timescales. Mothers react in consistent ways to the babbling of even unfamiliar infants, and as babbling becomes more speech-like it more strongly influences mothers' responding (Goldstein & West, 1999). Infants are sensitive to the reactions of caregivers and to their sounds, changing the amount and acoustic form of their babbling in response to changes in the form and timing of their caregivers' behavior (Goldstein et al., 2003).

In the Goldstein et al. (2003) study, mothers of 8- to 10-month-old infants wore wireless headphones, allowing them to receive instructions from an experimenter. When mothers responded (by smiling, moving closer, and touching) contingent to their infants' vocalizations, the infants' babbling incorporated increased voicing and faster consonant-vowel transitions, which are developmentally more advanced forms of production. In contrast, the infants of yoked control mothers, who received the same amount of social stimulation but without contingency, did not change their babbling. Infants must therefore recognize that their sounds produce a change in the environment in order for their sounds to change.

By manipulating caregiver-infant interactions in real time, multiple causes and timescales of vocal development become evident. The mechanisms that create vocal development are not restricted to the infant, but rather the system of caregiver and infant. Patterns of vocalizations are created by the interaction of multiple forces, including the articulatory apparatus, visual and auditory perceptual systems, and learning mechanisms. These components regulate and are regulated by caregiver availability and responsiveness. Vocal development is not an infant ability, but an emergent property of caregiver-infant interaction in that the vocal learning process is created by social interactions. Because developmental advances in babbling change the ways that caregivers react to their infants (Goldstein & West, 1999), setting the stage for new learning to occur, moment-to-moment social interactions are probably linked to the months-long stages (Oller, 2000) that reliably describe the first year of vocal development. From a dynamic systems view, maternal behavior and infant sensory capacities interact to generate the development of more advanced infant behavior. Thus, the patterns of interaction between caregivers and infants are a source of developmental change.

Contextual and Ecological Theorists

The tradition of the embryologists and the epigeneticists emphasized self-organization from multiple processes both in the organism and between the organism and its environment. The focus is on relationships among components as the origins of change, rather than a set of instructions. Such a view naturally turns our attention to the physical and social settings in which infants and children are raised, and it requires as detailed an understanding of the context as of the organism situated in that context. Existing developmental theories can be placed on a continuum as to whether they are more concerned with what is in the child's head or with the specific and changing details of the environment. Piagetian, cognitivist, and information-processing accounts of development, for instance, pay little attention to the particular nature of the physical and social worlds of children. The goal of these approaches is to understand general qualities of mind and how they develop. Because the processes are assumed to be universal adaptations to the world by human brains, it is immaterial, for instance, whether a child learns transitive inference from playing with sticks on the ground, or in a structured school, or by observing groups of people talking and acting. The focus is on the individual as the basic unit of analysis, in the sense that individuals all have common structures and processes above and beyond their differing experiences.

For theorists at the other end of the continuum, a person's experiences in context and culture are not just supportive of development, but are the very stuff of development itself. At this end of the continuum, we group developmentalists who are working in the tradi-

tion of James Mark Baldwin, John Dewey, and Kurt Lewin; more recently, A. R. Luria and L. S. Vygotsky; and who are labeled as *ecological, contextual,* or *cross-cultural* theorists. In addition, some versions of *life-span* perspectives (e.g., Baltes, 1987) also have strong epigenetic and systems assumptions. All these views are well represented in this *Handbook,* this volume, in the chapters by Overton (Chapter 2); Valsiner (Chapter 4); Gottlieb et al. (Chapter 5); Rathunde and Czikszentmihalyi (Chapter 9); Bradtstder (Chapter 10); Shweder et al. (Chapter 13); Elder, Bronfenbrenner, and Morris (Chapter 12); and Baltes, Lindenberger, and Staudinger (Chapter 11). Although there are many versions of contextualism (see reviews by Dixon & Lerner, 1988; Ford & Lerner, 1992), they share certain assumptions about development, and these assumptions overlap with many features of a dynamic systems approach. First and foremost is the quest to eliminate the duality between individual and environment, just as the epigeneticists endeavored to erase the boundaries between structure and function.

All developmental theorists would acknowledge that humans and other living beings can be described over many levels of organization from the molecular and cellular, through the complex level of neural activity and behavior, and extending to nested relationships with the social and physical environments (e.g., Bronfenbrenner, 1979). And all developmental theories also view these levels as interacting with one another. The deep difference between contextualism and more individual-centered approaches is that the levels are conceptualized as *more* than just interacting; instead, they are seen as integrally fused together. Behavior and its development are melded as ever-changing sets of *relationships* and the history of those relationships over time. Thus, as mentioned earlier, we must discard our notions of simple linear causality: That event A or structure X *caused* behavior B to appear. Rather, causality is multiply determined over levels and continually changing over time.

Systems ideas have radical implications for the study of mind. For example, the idea that knowledge is emergent and that human behavior is socially constructed in task and history is beautifully illustrated in Hutchins' (1995) recent study of navigation. Navigation in modern navies is achieved via a complex system of interactions among a large number of people and measuring devices. These interactions are shaped and maintained by the culture of military practice and language, but also by the geography of large ships, the measuring devices, the psychology of individuals, and the encountered tasks. No one element alone does the navigation. Hutchins' analysis, based on both participant observation and computer simulation, shows how all these elements matter—how the smartness of navigation teams emerges, depends on, and is constrained by the physical components, traditional roles, and culture. Navigation teams *are* smart. Their activity is event-driven and goal-directed. The navigation team must keep pace with the movement of the ship and must maintain progress. When things go wrong, there is no option to quit and start over; the right decision must be made at the moment. Hutchins' work shows how these decisions are distributed over the interactions of individuals—none of whom knows all there is to know about the problem. Nor is the optimal system one in which the problem has been logically divided up into mutually exclusive parts and assigned to individuals in a perfect division of labor. Rather, navigation teams are characterized by partially redundant and sometimes rapidly changing patterns of interactions and information flow. The intelligence sits in the patterns of interactions in the whole and has properties quite unlike those of the individuals who comprise that whole.

At the end of his book, Hutchins (1995) reflects on the meaning of culture and socially distributed cognition for cognitive science:

> The early researchers in cognitive science placed a bet that the modularity of human cognition would be such that culture, context, and history could be safely ignored at the outset and then integrated in later. The bet did not pay off. These things are fundamental aspects of human cognition and cannot be comfortably integrated into a perspective that privileges abstract properties of isolated individual minds. (p. 354)

General Systems Theories

We have described theoretical approaches to development at different levels of organization, from embryological to societal. These approaches are based on common assumptions about systems' complexity and the multiple interrelated causes of change. However, the characteristics of developing organisms emphasized in these views—self-organization, nonlinearity, openness, stability, and change—are not confined to biological systems. They are also found in complex physical systems such as chemical reactions, global weather changes, mountain streams, clouds, dripping faucets—

wherever many components form a coherent pattern and change over time. The principles of dynamic systems formulated by physicists and mathematicians to describe the behavior of such complex physical systems may also be the best way to study and understand developing organisms.

Kurt Lewin and Dynamic Force Fields. One of the earliest explicitly dynamic formulations of development was Kurt Lewin's (1936, 1946) topological *field theory* of personality development. Lewin was unabashedly antireductionist. How, he asked, can psychology present all the richness of human behavior as the novelist, but "with scientific instead of poetic means" (Lewin, 1946, p. 792)? Referencing Einstein's theoretical physics, Lewin (1946) proposed:

> The method should be analytical in that the different factors which influence behavior have to be specifically distinguished. In science, these data have also to be represented in their particular setting within the specific situation. A totality of coexisting facts which are conceived of as mutually interdependent is called a *field.* (p. 792)

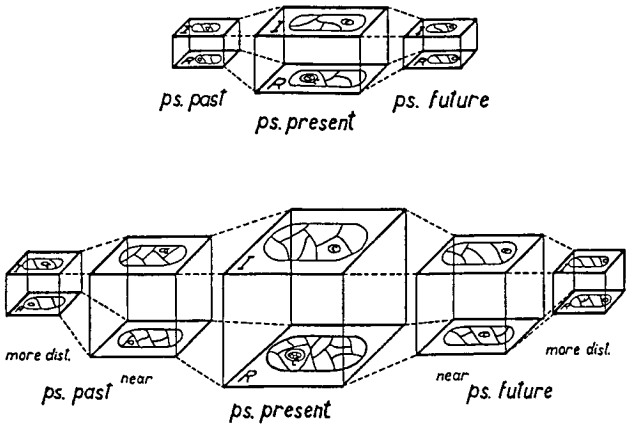


Figure 6.4 Lewin's psychological space (ps.) landscapes, depicted as layered systems of force fields with R = "reality" and I = "Irreality," and showing the connection between the motivational forces in the past, present, and future. The top panel depicts a life space of a young child; the bottom, that of an older child. *Source:* From "Behavior and Development as a Function of the Total Situation" (p. 798), by K. Lewin, in *Manual of Child Psychology,* L. Carmichael (Ed.), 1946, New York: Wiley. Copyright 1946 by John Wiley & Son. Reprinted with permission.

According to Lewin, a given physical setting has meaning only as a function of the state of the individual in that setting. Conversely, individual traits do not exist outside of the setting in which they are displayed. Lewin called these fields of interactions *life spaces*—fields of forces with varying strengths. People move dynamically through this force field, depending on their location in the space, their needs, and previous history. Forces may compete, conflict, overlap, or sum, depending on the person's disposition and the environment. Learning—and development—consist of finding a pathway or discovering a new niche in the life space. And as children carve new pathways, they actually create yet new parts of the space to explore, a process of self-organization.

Lewin depicted this developmental dynamic as shown in Figure 6.4. Life spaces at different points in development are represented by layered force fields, with different zones for varying degrees of "attraction" to those fields. The parameters of the life space have several dimensions: Size of the space, degree of specificity, separation between reality and "irreality" or fantasy, and the influence of psychological processes across time. The life space of a younger child is more limited and less differentiated, and it is influenced more by the immediate past and projects more into the immediate future than the more expansive space of the older child. Waddington's 1977 illustration of a phase-space diagram of development, shown in Figure 6.1, is remarkably similar to Lewin's in identifying preferred region and depicting development as a progressive drift through this space.

Systems Theory as Metaphor. Kurt Lewin's dynamic concepts were rich, but vague and difficult to operationalize. His ideas were poorly matched to either the mechanistic flavor of North American experimental psychology during the 1950s and 1960s, or to the mentalistic assumptions of Piagetian developmental psychology, and his impact on child psychology was little felt during those decades. Systems thinking about development underwent a small renaissance in the late 1970s and early 1980s, however, and these versions were much more explicitly tied to the new sciences of complexity in physics, math, and biology. Two authors, Ludwig von Bertalanffy, a biologist, and Ilya Prigogine, a chemist, were especially influential in this renewal.

Ludwig von Bertalanffy (1968) has usually been credited with originating "General Systems Theory." Since the 1930s, he has heralded an antireductionist

view of biological systems (von Bertalanffy, 1933). The dominant trend in all the sciences, from chemistry to psychology, was to isolate smaller and smaller elements of the system, but von Bertalanffy felt that understanding would come, not from these separate parts, but from the relationships among them. So, while animals are made of tissues and cells, and cells are built from complex molecules, knowing the structure of the molecules even in the greatest detail cannot inform us about the behavior of the animal. Something happens when complex and heterogeneous parts come together to form a whole that is more than the parts. The system properties need a new level of description—one that cannot be derived from the behavior of the components alone. These systems principles, in turn, are so universal that they apply to widely diverse beings and entities:

> We can ask for principles applying to systems in general, irrespective of whether they are of physical, biological, or sociological nature. If we pose this question and conveniently define the concept of system, we find that models, principles, and laws exist which apply to generalized systems irrespective of their particular kind, elements, and "forces" involved. (von Bertalanffy, 1968, p. 33)

von Bertalanffy provided dynamic equations to illustrate these principles: Wholeness or self-organization, openness, equifinality (self-stabilization), and hierarchical organization. In his discussion of systems applications to psychology, von Bertalanffy was especially critical of "homeostasis" models of mental functioning, especially the Freudian assumption that organisms are always seeking to reduce tensions and seek a state of equilibrium. Rather, organisms are also *active;* as an open system, they live in a kind of disequilibrium (what we will call dynamic stability) and actively seek stimulation. This disequilibrium allows change and flexibility; the idea that too much stability is inimical to change recurs in many developmental accounts (e.g., Piaget, Werner) and is an assumption we also find essential for understanding development.

The Nobel chemist Ilya Prigogine was the second principal contributor to systems theory and an eloquent popularizer as well (see, e.g., Prigogine, 1978; Prigogine & Stengers, 1984). Prigogine was primarily interested in the physics of systems that were far from thermodynamic equilibrium. Recall that, in Newtonian thermodynamics, all systems run to disorder. The energy of the universe dissipates over time. The universe increases in *entropy,* and, as Prigogine puts it, the "arrow of time" runs in only one direction—toward disorganization. But many systems, and all biological systems, live in thermodynamic nonequilibrium. They are thermodynamically open: They take in energy from their environment and increase their order—the arrow of time is at least temporarily reversed. Development is a premier example of a progressive *increase* in complexity and organization. Such systems take on special properties, including the ability to self-organize into patterns and nonlinearity or sensitivity to initial conditions. Again, it is critical that such systems are inherently "noisy," for order arises from such fluctuations. In equilibrium systems, the noise is damped out and the system as a whole remains in equilibrium. In nonequilibrium systems, in contrast, fluctuations can become amplified and overtake the organization of the whole system, shifting it to a new order of organization.

A number of developmentalists immediately recognized the relevance of these explicit systems principles for age-old, yet still critical, issues in developmental psychology. Sandor Brent (1978), for instance, saw in Prigogine's formulations of self-organization potential solutions for the questions of the origins of complexity and shifts from one developmental stage to more advanced levels. Moreover, Brent believed that ideas of nonlinearity could explain the seemingly "autocatalytic" aspects of development, where one small transformation acts as the catalyst for subsequent, accelerating changes.

Brent's discussion is strictly theoretical. Arnold Sameroff (1983) tied the new systems ideas more concretely to developmental phenomena. Sameroff has long been interested in developmental outcomes of children at risk, particularly in the failure of linear models to predict pathology from antecedent conditions. In an important and influential paper, Sameroff and Chandler (1975) documented the persistently puzzling finding that some children with very serious risk factors around birth, including anorexia, prematurity, delivery complications, and poor social environments, suffered no or little long-term consequences, while others sustained serious effects. Simple cause-and-effect or medical models of disease must be supplanted with a thoroughgoing organismic model, according to Sameroff, where "Emphasis on a wholistic, actively functioning entity that constructs itself out of transactions with the environment is derived from the properties of biological development" (1983, pp. 253–254).

Adoption of such a systems model, with its assumptions of wholeness, self-stabilization, self-organization, and hierarchical organization, has implications for every aspect of developmental psychology, according to Sameroff. For instance, theories of socialization must become thoroughly contextual, because the notion of open systems means that the individual is always in transaction with the environment. Biological vulnerability or risk, in this case, does not exist in a vacuum, but within the rich network of a more or less supportive family and community culture. Outcome is a joint product of the child and the cultural agenda of the society, and the total system has self-organizing and self-stabilizing characteristics.

Likewise, the issue of *change* motivates the *developmental system theory* of Ford and Lenrer (1992). In reasoning that closely parallels our own, Ford and Lerner begin with a view of humans as "multilevel, contextual organizations of structures and functions" (p. 47) who exhibit varying kinds of stability and variability and who can change both in and between levels. Individual development, according to these theorists:

> *involves incremental and transformational processes that, through a flow of interactions among current characteristics of the personal and his or her current contexts, produces a succession of relatively enduring changes that elaborate or increase the diversity of the person's structural and functional characteristics and the patterns of their environmental interactions while maintaining coherent organization and structural-functional unity of the person as a whole.* (p. 49, italics in original)

The definition, they maintain, implies a lifelong possibility of change, multiple (although not infinite) and nonlinear developmental pathways, discontinuities, and the emergence of new forms. Furthermore, the definition specifies that development is never a function of person or context alone, but indeed results as a function of their dynamic interaction. Figure 6.5 is Ford and Lerner's model of developmental change as a series of probabilistic states, where control systems interact in the person and the environment. States are thus the current configuration of the system, based both on current status and on the system's immediate and long-term history. We will repeat these themes throughout the remainder of this chapter.

Ford and Lerner's treatise is ambitious in scope; it ties biological and social development into a single developmental systems theory. Their intellectual debt is directly to the "organismic" and contextual school of developmental theory, and less so to physical and mathe-

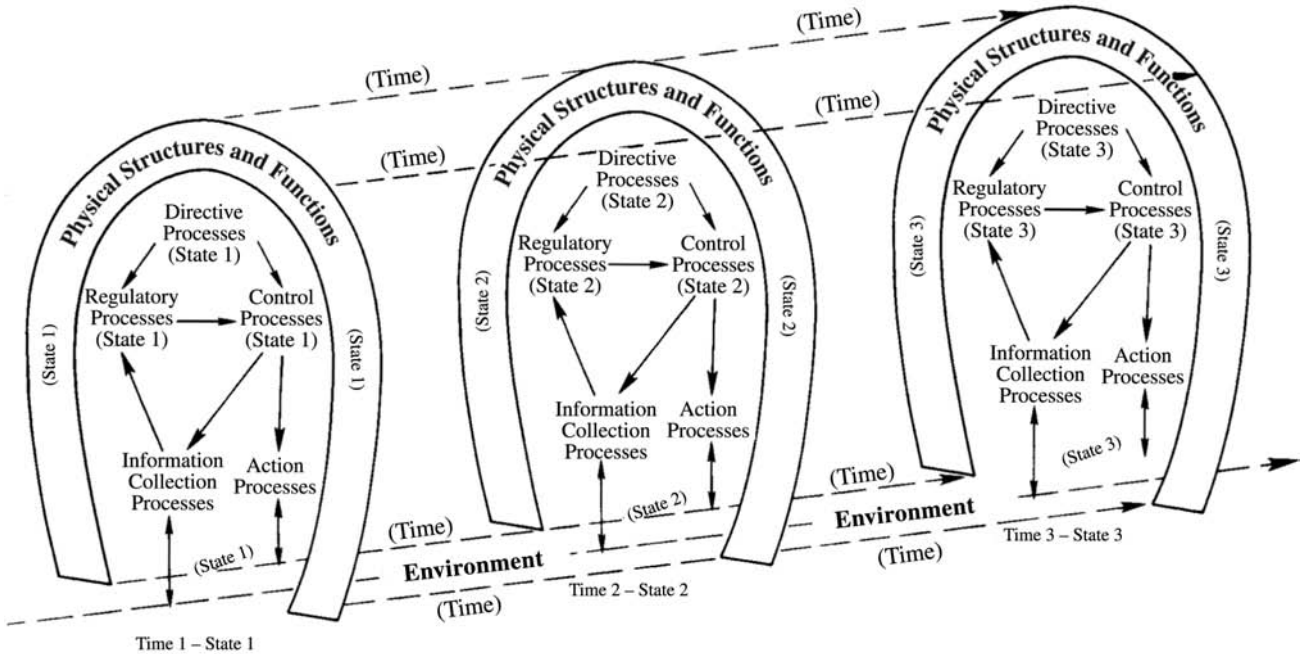


Figure 6.5 Ford and Lerner's model of developmental change as a series of probabilistic states.

matical dynamical systems. Likewise, they are not primarily concerned with operational verification of a systems approach, nor do they connect directly with the experimental and observational studies of individual child development.

This overview of the historical heritage shows systems approaches to have enduring appeal to developmentalists. This makes sense. As developmentalists, we are continually faced with the richness and complexity of the organisms we study and the elaborate causal web between active individuals and their continually changing environments. The recent contribution of the dynamic systems theories to this tradition is that such theories allows us to express, in words and in mathematical formalisms, complexity, wholeness, emergence of new forms, and self-organization. They provide a way to express the profound insight that pattern can arise without design: Developing organisms do not know ahead of time where they will end up. Form is a product of process.

An Introduction to Dynamics Systems Thinking

Despite a long tradition of systems thinking in development, from embryology to the study of culture and society, these formulations have remained more of an abstraction than a coherent guide to investigation or a means for synthesis of existing data. Developmentalists may acknowledge that systems matter, but it has been difficult to design and carry out empirical research based on a core of systems principles. In the remainder of this chapter, we summarize a set of dynamic principles applicable to human development and then show how research can be inspired, conducted, and interpreted from a dynamic perspective. We base our summary of dynamic systems heavily on the brand of dynamics set forth by Haken (1977) called *synergetics.* Note that other formal systems of dynamics have been applied to development, such as van Geert's "logistic growth model," van der Maas and Molenaar's "catastrophe theory" that we will discuss subsequently. Still other examples can be found in Smith and Thelen (1993).

Nature is inhabited by patterns in time. The seasons change in ordered measure, clouds assemble and disperse, trees grow to certain shape and size, snowflakes form and melt, minute plants and animals pass through elaborate life cycles that are invisible to us, and social groups come together and disband. Science has revealed many of nature's secrets, but the processes by which these complex systems form patterns—an organized relationship among the parts—remain largely a mystery. In the past decade or so, however, physicists, mathematicians, chemists, biologists, and social and behavioral scientists have become increasingly interested in such complexity, or in how systems with many, often diverse, parts cooperate to produce ordered patterns. The scientific promise is that a common set of principles and mathematical formalisms may describe patterns that evolve over time, irrespective of their material substrates.

Order from Complexity

The key feature of such dynamic systems is that they are composed of very many individual, often heterogeneous parts: molecules, cells, individuals, or species, for example. The parts are theoretically free to combine in nearly infinite ways. The *degrees of freedom* of the system are thus very large. Yet, when these parts come together, they cohere to form patterns that live in time and space. Not all possible combinations are seen; the original degrees of freedom are compressed. But the patterns formed are not simple or static. The elaborate shapes or forms that emerge can undergo changes in time and space, including multiple stable patterns, discontinuities, rapid shifts of form, and seemingly random, but actually deterministic changes. The hallmark of such systems is that this sequence of *complexity to simplicity to complexity* emerges without prespecification; the patterns organize themselves. Our mountain stream shows shape and form and dynamic changes over time, but there is no program in the water molecules or in the stream bed or in the changes of climate over geological time that encodes the ripples and eddies.

Developing humans are likewise composed of a huge number of dissimilar parts and processes at different levels of organization, from the molecular components of the cells, to the diversity of tissue types and organ systems, to the functional defined subsystems used in respiration, digestion, movement, cognition, and so on. But behavior is supremely *coherent* and supremely *complex,* again showing complexity from simplicity from complexity. The self-organization of mountain streams is manifest; we argue here that the patterns seen in developing humans are also a product of the relations among multiple parts.

Both mountain streams and developing humans create order from dissimilar parts because they fall into a class called *open systems,* or systems that are *far from*

thermodynamic equilibrium. A system is at thermodynamic equilibrium when the energy and momentum of the system are uniformly distributed and there is no flow from one region to another. For instance, when we add alcohol to water or dissolve salt in water, the molecules or ions mix or react completely. Unless we heat the system or add an electric current, the system is stable. Nothing new can emerge; the system is *closed.* Systems such as moving stream beds or biological systems evolve and change because they are continually infused with or transfer energy, as the potential energy of water at the top of the mountain is converted to the kinetic energy of the moving water. Biological systems are maintained because plants and animals absorb or ingest energy, and this energy is used to maintain their organizational complexity. Although the second law of thermodynamics holds that systems should run down to equilibrium, this is only globally true. Locally, some systems draw on energy and increase their order.

Open systems, where many components are free to relate to each other in nonlinear ways, are capable of remarkable properties. When sufficient energy is pumped into these systems, new ordered structures may spontaneously appear that were not formerly apparent. What started out as an aggregation of molecules or individual parts with no particular or privileged relations may suddenly produce patterns in space and regularities in time. The system may behave in highly complex, although ordered ways, shifting from one pattern to another, clocking time, resisting perturbations, and generating elaborate structures. These emergent organizations are totally different from the elements that constitute the system, and the patterns cannot be predicted solely from the characteristics of the individual elements. The behavior of open systems gives truth to the old adage, "The whole is more than the sum of the parts."

The condensation of the degrees of freedom of a complex system and the emergence of ordered pattern allows the system to be described with fewer variables than the number needed to describe the behavior of the original components. We call these macroscopic variables the *collective variables* (also called *order parameters*). Consider human walking, a multidetermined behavior. At the microscopic level of all the individual components—muscles, tendons, neural pathways, metabolic processes, and so on—the system behaves in a highly complex way. But when these parts cooperate, we can define a collective variable that describes this cooperation at a much simpler level—for instance, the alternating cycles of swing and stance of the feet. This cyclic alternation is a collective variable, but it is not the only one. We might also look at patterns of muscle firing or forces generated at the joints. The choice of a collective variable is a critical step in characterizing a dynamic system, but it is not always easy to accomplish, and it may depend considerably on the level of analysis to be undertaken.

Attractors and Dynamic Stability

A critical property of self-organizing, open systems is that, although an enormous range of patterns is theoretically possible, the system actually displays only one or a very limited subset of them, indexed by the behavior of the collective variable. The system "settles into" or "prefers" only a few modes of behavior. In dynamic terminology, this behavioral mode is an *attractor* state, because the system—under certain conditions—has an affinity for that state. Again in dynamic terms, the system prefers a certain location in its *state,* or *phase space,* and when displaced from that place, it tends to return there.

The state space of a dynamic system is an abstract construct of a space of any number of dimensions whose coordinates define the possible states of the collective variable. For example, the behavior of a simple mechanical system such as a pendulum can be described completely in a two-dimensional state space where the coordinates are position and velocity as seen in Figure 6.6. As the pendulum swings back and forth, its motion can be plotted on this plane. The motion of

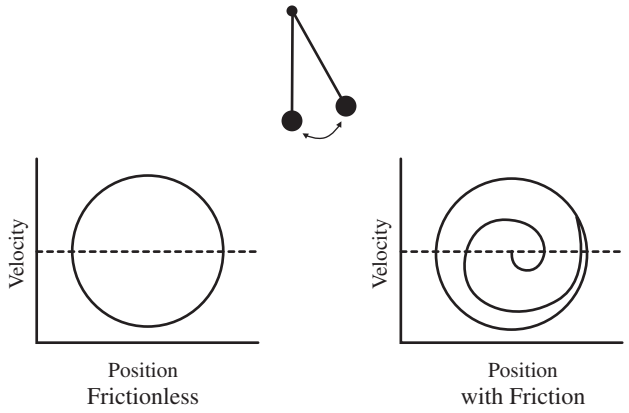


Figure 6.6 A simple pendulum as a dynamic system. Without friction, the pendulum will exhibit a *limit cycle attractor.* With friction, the pendulum will settle into a single, *point attractor.*

an ideal, frictionless pendulum prescribes an orbit or path through the state space that tracks its regular changes of position and velocity. If we add friction to the pendulum, it will eventually come to rest, and its orbit will look like a spiral.

The circular orbit of the frictionless pendulum and the resting point of the pendulum with friction are the attractors of this system. When friction is present, the attractor is a *point attractor* because all the trajectories in the space converge on that resting point, regardless of the system's starting point or initial conditions. Although the pendulum has only one fixed point, biological systems commonly have more than one point attractor; the system may reach one of the several possible equilibrium points, depending on the initial conditions. All the initial conditions leading to a particular fixed point attractor are called *basins of attraction.*

In the pendulum example, without friction, the attractor is of the *limit cycle* or *periodic* type; it will continually repeat its oscillations. When the pendulum is slightly perturbed, it returns, in time, to its periodic behavior. Once the pendulum is given its squirt of energy, these time and space patterns capture all other possible trajectories in the state space, and they represent stable collective variables for the pendulum system. In biological organisms, periodic behavior is often the collective result of the *coordination of* components each with its own preferred pattern (Kugler & Turvey, 1987; Schōner & Kelso, 1988). Consider human locomotion. The cyclic alternation of the legs during normal walking reflects the coupling of two legs 180 degrees out of phase. Such coordination dynamics can be represented on a phase space consisting of all the possible phase relationships between the two legs. In dynamic terms, there is a strong attractor at 180 degrees out-of-phase. Given ordinary conditions, people prefer to locomote by using their legs in alternation, however, there are also periodic attractors at 0 degrees (jumping) or 90 degrees (galloping), but they are far less stable under normal circumstances, and thus are rarely seen (at least in adults!).

Finally, a special type of attractor, the *chaotic* attractor, has received much attention in popular accounts of nonlinear dynamics. *Chaos* has a particular technical meaning in dynamics. Chaos describes systems whose behaviors look random at close glance but, when plotted over a long time on a state space, are not random and display extremely complex geometric structures. There is growing evidence that many biological systems are chaotic—for example, heart rate fluctuations (Goldberger & Rigney, 1988), electrical activity in the olfactory bulb (Freeman, 1987), and patterns of movements in human fetuses (Robertson, 1989).

For developmentalists, the most important dimension of a behavioral pattern preference or attractor is its *relative stability.* The concept of dynamic stability is best represented by a *potential landscape.* Imagine a landscape of hills and valleys, with a ball rolling among them depicting the state of the collective variable as shown in Figure 6.7. A ball on the top of a hill (a) has a lot of stored potential energy; with just a very small push, it will roll down the hill. Thus, the state of the system, represented by the ball, is very unstable. Any nudge will dislodge it. A ball in a deep valley (b), in contrast, has very little potential energy and needs a large external boost to change its position. The latter is a very stable attractor; the former is called a *repellor* because the system does not want to sit on the hill. A ball in a shallow well (c) is moderately stable, but will respond to a sufficient boost by moving into the neighboring well (while not dwelling very long on the hillock in between). Over a long enough time, all the balls in the landscape

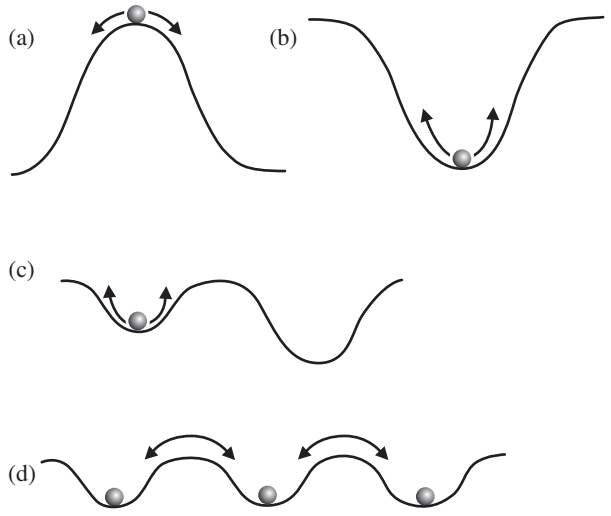


Figure 6.7 Stable and unstable attractors. The stability of the attractor depicted as potential wells. The ball on the top of the hill (a) has a lot of potential energy, and even a very small push will dislodge it; it is a repellor. The ball at the bottom of the step hill (b) requires a large energy boost to send it over the top. If perturbed, it will quickly return to the bottom. It is a stable attractor. The ball in the shallow well (c) is in a less stable situation. Relatively small perturbations will push the ball around, although, given enough time, it will probably end up in the deeper well because of its own stochastic noise. A behavioral system (d) may have multistability.

will end up in the deepest valley, although neighboring valleys may be deep enough that escape from them is very unlikely. Figure 6.7d also shows such a *multistable* attractor, with three point attractors and two repellors between them.

The stability of a system can be measured in several ways. First, stability is indexed by the statistical likelihood that the system will be in a particular state rather than other potential configurations. Second, stability responds to perturbation. If a small perturbation applied to the system drives it away from its stationary state, after some time the system will settle back to its original equilibrium position. As seen in Figure 6.7, when the potential valley is deep and the walls are steep, the ball will return quickly to the bottom. In contrast, the same perturbation applied to a ball in a shallow potential well will take longer to return to equilibrium because the restoring force is less. If the ball is pushed away from a hilltop, however, it will never return. Thus, one indication of system stability is this *local relaxation time* after a small perturbation.

Third, stability is related to the system's response to natural fluctuations within the system. Recall that complex systems exhibiting patterns are composed of many subsystems. Each of these subsystems has noise associated with it, and these intrinsic noises act as stochastic forces on the stability of the collective variable. This is another way of saying that complex systems, even apparently stable ones, are nonetheless dynamic. If the system resides in a steep and deep well, these random forces will have little effect and the ball will not fluctuate very much around the mean attractor pattern. In the shallow well, however, these small forces are more effective and the ball should roll around more. The size of the deviations from the attractor state can be measured, for example, by the variance or standard deviation of the collective variable around the attractor state. The more stable the attractor, the smaller the standard deviation around the attractor.

Soft Assemblies

As Figure 6.7 indicates, calling a pattern an attractor is a statistical statement about where the system prefers to reside, and how resistant it is to internal and external forces. Although some attractor states are so unstable as to almost never be observed, other attractor states are so stable that they look like they are inevitable. Because these behavioral states are so reliably seen under certain circumstances, it is easy to believe that they are generated by hardwired structures or programs within the system. Very stable attractors take very large pushes to move them from their preferred positions, but they are dynamic and changeable nonetheless. This is one way of saying that the system is "softly assembled" (Kugler & Turvey, 1987) rather than hardwired or programmed. The components can assemble in many ways, although only one or several of them are stable enough to be seen. We argue here that, in action and cognition, and in development, many configurations that act like programs, stages, or structures are stable attractors whose stability limits may indeed be shifted under appropriate circumstances. That is to say, many mental constructs and movement configurations—object permanence and walking, for example—are attractors of such strength and stability that only the most severe perturbations can disrupt them. They look as though they are wired in. Other abilities—transitive inference, visual illusions, and many sport skills, for example—have attractors whose stability is easily upset by contextual manipulations or lack of practice, or by not paying attention.

A good developmental example of a softly assembled system is the infant locomotor pattern of creeping on hands and knees. This pattern has traditionally been described as a "stage" in the ontogeny of human locomotion: Nearly all human infants crawl before they walk. It is tempting to think of crawling as a necessary precursor to upright locomotion; indeed, some physical therapists believe infants must go through this stage for successful sensorimotor integration. In dynamic terms, however, we can see creeping as a temporary attractor, a pattern that the system prefers, given the current status of the infant's neuromuscular system and the infant's desire to get something attractive across the room. When babies do not have the strength or balance to walk upright, creeping is a self-assembled solution to independent mobility—a statistical probability, but not an inevitable solution. In fact, some infants use anomalous patterns such as crawling on their bellies or scooting on their bottoms, and some infants never crawl at all. The typical crawling pattern then is a preferred attractor, but not a hardwired stage.

Soft assembly is the core assumption of a dynamic view of development. It banishes forever the vocabulary of programs, structures, modules, and schemas and supplants these constructs with concepts of complexity, stability, and change. Stability defines the collective states of the system, assessed by its resistance to change. Fluctuations around stable states are the inevitable accompa-

niment of complex systems. These fluctuations—the evidence that a system is dynamically active—are the source of new forms in behavior and development.

How Systems Change: Fluctuations and Transitions

We have defined behavioral patterns as variously stable, softly assembled attractor states. How do patterns change, as they do in development or in learning? Here we invoke the notion of nonlinearity, a hallmark of dynamic systems. A pattern in a dynamic system is coherent because of the cooperation of the components. This coherence is maintained despite the internal fluctuations of the system and despite small external pushes on it. Thus, because walking is a very stable attractor for human locomotion, we can walk across the room in high-heeled shoes, on varied surfaces, and even while we are talking or chewing gum. But as the system parameters or the external boundary conditions change, there comes a point where the old pattern is no longer coherent and stable, and the system finds a qualitatively new pattern. For example, we can walk up hills of various inclines, but when the steepness of the hill reaches some critical value, we must shift our locomotion to some type of quadrupedal gait—climbing on all fours. This is an example of a *nonlinear phase shift* or *phase transition,* highly characteristic of nonequilibrium systems.

In the case of our locomotor patterns, the parameter change was simply the steepness of the hill to climb. Gradual changes in this parameter engendered gradual changes in our walking until a small change in the slope causes a large change in our pattern. In dynamic terminology, the slope changes acted as a *control parameter* on our gait style. The control parameter does not really "control" the system in traditional terms. Rather, it is a parameter to which the collective behavior of the system is sensitive and that thus moves the system through collective states. In biological systems, any number of organismic variables or relevant boundary conditions can be relatively nonspecific, and often may be changes in temperature, light, speed of movement, and so on.

For example, Thelen and Fisher (1982) discovered that body weight and composition may act as a control parameter for the well-known "disappearance" of the newborn stepping response. Newborn infants commonly make stepping movements when they are held upright, but after a few months, the response can no longer be elicited. Although the traditional explanation has been inhibition of the reflex by higher brain centers, Thelen and Fisher noticed that movements similar to steps did not disappear when infants were supine instead of upright. This made a central nervous system explanation unlikely. Rather, they noticed that infants gained weight, and especially body fat, at a rapid rate during the period when stepping was suppressed. They reasoned that as their legs got heavier without a concomitant increase in muscle mass, the infants had increasing difficulty lifting their legs in the biomechanically demanding upright posture. Body fat deposition is a growth change that is not specific to leg movements, yet it affected the system such that a qualitative shift in behavior resulted.

Change may thus be engendered by components of the system that are nonobvious, but, in other cases, the control parameter may be specific to the system in question. For example, practice or experience with a specific skill may be the critical factor. For instance, 8- to 10-month-old infants do not reach around a transparent barrier to retrieve a toy (Diamond, 1990b). Normally, infants have little experience with transparent barriers. However, when Titzer, Thelen, and Smith (2003) gave infants transparent boxes for several months, the babies learned to shift their usual response of reaching in the direct line of sight in favor of reaching into the opening of the box. In this case, infants' learning the perceptual properties of transparent boxes through exploration was the control parameter engendering the new form of knowledge.

As we discussed earlier, not all changes in a system are phase shifts. At some values of a control parameter, the system may respond in a linear and continuous manner. Nonlinearity is a threshold effect; a small change in the control parameter at a critical value results in a qualitative shift. Control parameters (whether they are nonspecific, organic, or environmental parameters) or specific experiences lead to phase shifts by threatening the stability of the current attractor. Recall that all complex systems carry in them inherent fluctuations. When the system is coherent and patterns are stable, these fluctuations are damped down. However, at critical values of the control parameter, the system loses its coherence, and the noise perturbs the collective variable. At some point, this noise overcomes the stability of cooperative pattern, and the system may show no pattern or increased variability. However, sometimes as the control parameter passes the critical value, the system may settle into a new and different coordinative mode.

The most elegant demonstration of behavioral phase transitions comes from the work of Kelso and his

colleagues in a long series of studies and models of human bimanual coordination (see the extensive discussion in Kelso, 1995). The basic experiment is as follows: Participants are asked to move their index fingers either in-phase (both fingers flexed and extended together) or antiphase (one finger flexed while the other is extended). They are then told to increase the pace of the cyclic movements. Participants who begin in the antiphase condition usually switch to in-phase just by speeding up with no change in patterns. Thus, both patterns are stable at low frequencies, but only the in-phase is stable at higher frequencies. In dynamic terms, the collective variable of *relative phase* is sensitive to the control parameter, frequency.

Using this simple experiment, Kelso and his colleagues showed definitively that the phase shift from anti- to in-phase movements was accompanied by a loss of system stability. The standard deviations around a mean relative phase remained small until just before each participant's transition, when the deviations increased dramatically. Then, as the participant settled into the in-phase pattern after the shift, deviations were again small. Likewise, when Scholz, Kelso, and Schōner (1987) perturbed the movements with a small tug during the various frequencies, they observed that recovery to the desired frequency was more difficult as participants approach the anti- to in-phase transition. Disintegration of the system coherence was reflected in diminishing strength of the antiphase attractor to pull in the trajectories from various regions of the state space.

Development from a Dynamic Systems Perspective

In this section, we give an overview of dynamical systems using Waddington's epigenetic landscape as a means of illustrating the main concepts. We then use the developmental problem of learning to reach as an example of how these themes can be used to guide experiments and research. Finally, we turn to the development of the object concept, and, in particular, use the A-not-B error to show how these ideas may be incorporated into formal theories of behavior and development.

A Dynamic Epigenetic Landscape

We have thus far described self-organizing systems as patterns of behavior "softly assembled" from multiple, heterogeneous components exhibiting various degrees of stability and change. According to a dynamic systems view, development can be envisioned as a series of patterns evolving and dissolving over time, and, at any point in time, possessing particular degrees of stability. Expanding on the potential landscape representation we introduced earlier, we can depict these changes, in an abstract way, in Figure 6.8 our depiction closely parallels Waddington's famous epigenetic landscape (Figure 6.2) in both its early (1957) and later (1977) incarnations.

The first dimension in Figure 6.8 is time (Muchisky, Gershkoff-Stowe, Cole, & Thelen, 1996). The landscape progresses irreversibly from past to present, from background to foreground. The second dimension—the surface—is that of the collective variable, or a measure of the cooperative state of the system. Each of the lines forming the landscape represents a particular moment in time. These lines depict the range of possibilities of the system at that point in time. The configuration of each line is a result of the history of the system up to that point, plus the factors acting to parameterize the system at the time—such as the social and physical context, the

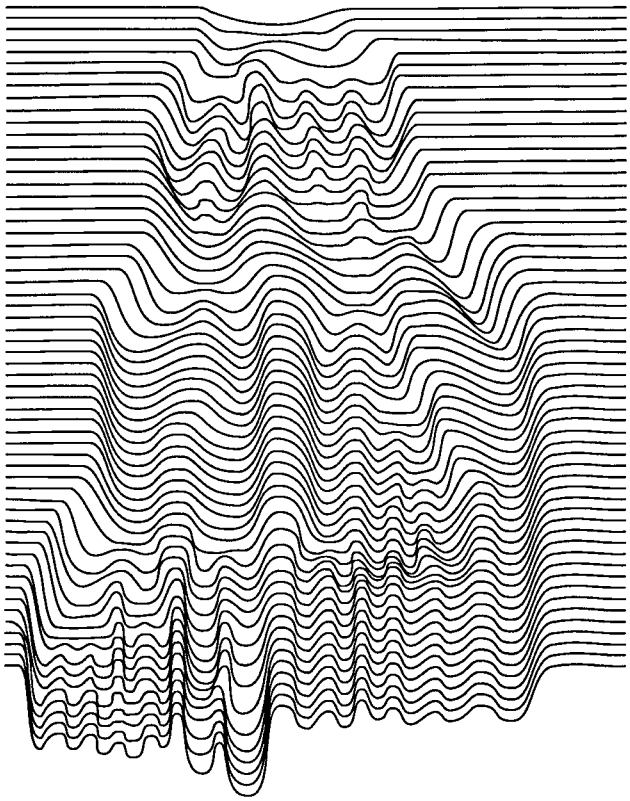


Figure 6.8 An adaptation of Waddington's epigenetic landscape (Figure 6.2). This version depicts behavioral development as a series of evolving and dissolving attractors of different stability.

motivational and attentional state of the child, and so on. The third dimension of the landscape is related to the depth of the variations of the collective variable lines, the various dips and valleys. The depth represents the stability of the system at that point in time, and in that particular combination of constraining factors, and thus captures the probabilistic rather than rigidly fixed nature of behavioral and cognitive states.

Nested Timescales

The landscape represents one critical property of developing dynamic systems: The nesting of changes on multiple timescales. The contexts and conditions that determine the stability of a system at any point in time (t) constitute the initial conditions for the state of the system at the next instant of time ($t + 1$). Likewise, the properties of the system at ($t + 1$) determine its state at ($t + 2$), and so on. The system is thus *reiterative;* each state is dependent on the previous state.

Most important, this reiterative process occurs at all timescales. Thus, a landscape of evolving and dissolving stabilities just as easily depicts the dynamics of a real-time process, such as reaching for an object, producing a sentence, or solving an addition problem as it represents changes in those abilities over minutes, hours, days, weeks, or months. In dynamic terms, the timescales may be *fractal* (Grebogi, Ott, & Yorke, 1987) or have a self-similarity at many levels of observation. For example, coastlines are typically fractal—the geometry of the coastline depends entirely on the scale by which it is measured. Represented on a scale of kilometers, the coast may be described as a simple curve, but that simplicity disappears when the measuring scale is meters or centimeters. Nonetheless, the simple curve *is* the collection of small coves and irregularities apparent to the person walking on the beach as well as to the small sand crab inhabiting a different geometric scale. Likewise, we argue, while perceiving, acting, and thinking occur in their own times of seconds and fractions of seconds, these accumulated actions constitute the larger coastline of developmental change (Samuelson & Smith, 2000).

In a dynamic view, each behavioral act occurs *over time,* showing a course of activation, peak, and decay, and with various levels of stability associated with each point in time, but every act changes the overall system and builds a history of acts over time. Thus, repeating the same behavior in seconds or minutes can lead to habituation or to learning, as the activity of one instant becomes the starting point for the activity of the next. We can thus envision a small-scale landscape evolving in the domain of *real time* as in Figure 6.9. In our illustration, consider behavioral act A with a sharp rise time of activation and a very slow decay. With repetition, the threshold for activating A is diminished because the activity has been primed by previous activations. The behavior becomes more stable, more easily elicited, and less able to be disrupted—the person has learned something. An equally plausible account is that activating A might raise the threshold for a repetition of the same act, as happens in adaptation, habituation, or boredom.

Because the history of acting in real time counts, the real-time dynamics of actions may display this important property of *hysteresis* (e.g., Hock, Kelso, & Schōner, 1993), when the same conditions lead to different behavioral outcomes, depending on the immediate previous history of the system. Behavioral acts therefore carry with them not only the dynamics of their immediate performance, but a *momentum* (e.g., Freyd, 1983) so that the system is always impacted by every act of perceiving, moving, and thinking, albeit to various degrees. Just as minute-by-minute activities carry with them a history and build momentum, so also do these accumulated histories constitute the stuff of learning and development change. Each line in our landscape depicting the probability of the system's states contains its own fractal timescale. Thinking and acting are functions of the history of thinking and acting at the same time that development is also of that history. Habituation, memory, learning, adaptation, and development form one seamless web built on process over time—activities in the real world.

Such a view of nested timescales radically changes our views of what is "represented" in the brain. Typically, in

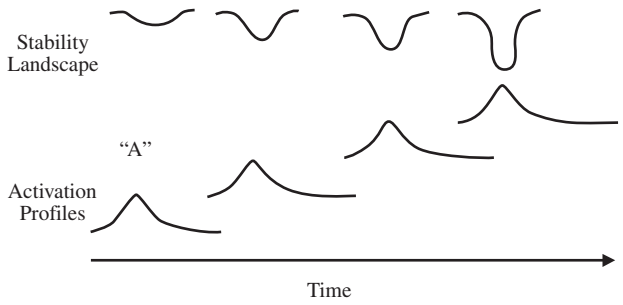


Figure 6.9 Effect of repeating behavior over time. Each activation may act to prime or to lower the threshold for the next repetition. A lowered threshold may make behavior more stable, acting as a local attractor.

studies of cognitive development, researchers present infants and children with tasks designed to assess what the children really know. Thus, experiments that show infants possible versus impossible physical events purport to reveal whether infants know that objects are solid, cannot occupy the same space as another object, obey the laws of gravity and momentum, and so on (e.g., Baillargeon, Spelke, & Wasserman, 1985; see also Cohen & Oakes, 1993). Or, on the basis of their performance with a series of colored rods, children are assumed to "have" the ability to make transitive inferences—to infer a third relation from two others. ("If the blue rod is longer than the green rod and the green rod is longer than the yellow rod, is the blue rod longer than the yellow rod?") If children fail on these tests, they do not have the knowledge of physical properties of objects or the ability to think about two things at the same time.

The core assumption here is that knowledge or abilities are stored "things" that are timeless and exist outside their here-and-now performance. An experimental task is good only as it reflects a "true" reading of the underlying mental structure. This common viewpoint has run into serious difficulties, however, both empirically and theoretically. First, literally thousands of studies have demonstrated that children's knowledge or their ability to use certain procedures is extremely fluid and highly dependent on the entire context of the experimental situation, including the place of the experiment, the instructions and clues, their motivation and attention, and very subtle variations in the task (Thelen & Smith, 1994). For example, based on the colored rod task, Piaget concluded that preschoolers could not make transitive inferences. However, when Bryant and Trabasso (1971) drilled preschoolers in the premise information until they learned and remembered that "the blue rod is longer than the green one," the preschoolers *could* make these inferences. Similarly, the failure of 6-month-old infants to search for hidden objects led Piaget to believe that infants cannot mentally represent objects when they are out of sight (Piaget, 1954). Yet, at the same age, infants act surprised when they *watch* objects disappear from expected locations.

To explain these strange results—how children can know things in one situation, but not another—developmentalists have proposed that the child has the "real" competence all along, but the failure lies in some performance ability. In the case of transitive inference, Bryant and Trabasso (1971) reasoned that the failure was not in lacking the mental structure, but in remembering the premises. When they trained memory, the competence was revealed. Likewise, 6-month-old infants do know that objects persist, but they are deficient in searching—actually reaching out, removing a cover, and retrieving the object. Changing the task to remove the search component revealed the essential knowledge of object permanence. Very young children may thus possess considerable cognitive competence, but the competence is hidden because of immature memory, motor skills, language, or attention.

This distinction between competence and performance has been a major force in developmental thinking for the past 20 years (Gelman, 1969). In domain after domain, researchers have followed this train of logic: Define the *essence* of some knowledge structure, do a thorough task analysis, strip away the supporting process and performance variables, and see whether children possess the "essential" knowledge. By these procedures, researchers have unmasked cognitive competences at earlier and earlier ages, certainly beyond those proposed by Piaget and his followers. In addition, the competence/performance distinction seems to help explain Piagetian *decalage:* Why the same child may perform at one cognitive level in one task and at another level in tasks believed to tap into a similar structure. Again, the difficulty lies in the ability of the task to actually reveal the hidden structure.

Why does a dynamic account render the competence/performance distinction as theoretically insufficient? Because behavior is always assembled *in time.* There is no logical way of deconstructing what is the "essential," timeless, and permanent core and what is only performance and of the moment. Because mental activity has developed in time from fundamentals in perception and action and is always tied in real time to an internal and external context, there is no logical way to draw a line between these continuous processes. The essence of knowledge is not different from the memory, attention, strategies, and motivation that constitute knowing. In addition, seeking a core competence often reduces to an exercise in task analysis. Does watching objects disappear constitute the true measure of object permanence? How many clues are allowed in the experiment, or how many familiarization trials are sufficient to peel away the superfluous performance impedances? Does not being able to retrieve a hidden object mean that the child really "knows," or is knowing separate in this case from knowing in order to act? One danger of such accounts is that, in the quagmire of definitions and task

analysis, developmental process itself is lost. How does it happen that this child behaves as he or she does at this moment in this context? What in the child's history, or in the history of children in general, leads to these patterns in time?

Layered Levels of Analysis. Taking time seriously also means integrating over multiple timescales and levels of analysis. Neural excitation, for example, happens in milliseconds. Reaction times are of the order of hundreds of milliseconds. People learn skills after hours, days, and months of practice. Developmental change occurs over weeks, months, years. Traditionally, psychologists have considered action, learning, and development as distinct processes. But for the organism time is unified and coherent, as are the different levels in the system. Every step an infant takes, for example, is both a product and a producer of change—at the level of neurons, eyeballs and muscles, motivations, and ideas about space and surfaces. A complete theory of walking requires integrating mechanisms of change at all these levels. The study of development, then is necessarily concerned with how change at different times and at different levels of analysis interact.

An illustration of this is presented in the work of Neville and her colleagues (see Neville & Bavelier, 2002 for review) on the neural and behavioral development of deaf individuals. Growing up deaf leads to different outcomes in *visual processing* which are readily apparent in event-related potentials (ERPs) in response to peripheral visual events. She found that such ERPs from visual areas were 2 to 3 times larger for hearing than for deaf individuals. Neville explains these differences in terms of the competitive processes that operate in development between visual and auditory cortical regions. But think about what this means in terms of the dynamics of change. The moment-to-moment experiences of individual deaf children—internal neural activity on the order of milliseconds—is different for a visual system developing without audition than for one developing with audition. The accrued effects of these millisecond differences in neural activity *over the long term* create changes in neural connectivity that then determine the different patterns of neural activity evident in the ERPs of hearing and deaf adults. Events on the order of milliseconds, repeated over a longer timescale cause changes in both slower processes of growth (neuronal connectivity) and also faster processes of neural activation (ERPs).

We note here several other research programs that also explicitly seek an understanding of developmental change in nested levels of analyses (Gershkoff-Stowe, 2001, 2002) show how every word that a child utters changes the processes of lexical retrieval, changes that in turn enable the system to produce many different words in rapid succession. Likewise, Adolph, Vereijken, and Shrout (2003) show how every step taken down an incline plane changes the body dynamics and what an infant knows about slopes. Finally, Thomas and Karmiloff-Smith's (2003) recent work on developmental disorders, and particularly William's syndrome, cogently makes the point that understanding development—and intervening effectively—requires understanding how processes of change on multiple timescales interact with each other to create the developmental trajectory. Their general program of research is based on the idea that static models of brain functioning—where functions are mapped to circumscribed brain regions—are inappropriate for the study and understanding of developmental disorders, including genetically based ones such as William's syndrome. Rather, they argue that the brains of atypically developing children are not normal brains with parts intact and parts impaired (as is the case in normal adult brain injury) but brains that have developed differently throughout embryogenesis and postnatal development. Reminiscent of the conclusions from Neville's studies of brain development in the deaf, structure-function mappings in the brain are a product of a developmental cascade involving processes at many timescales. The simulation studies by Thomas and Karmiloff-Smith (2003) provide particularly useful insights into atypical developmental trajectories, which grow out of small differences in the timing and operation of general processes (see also Elman, Bates, Johnson, & Karmiloff-Smith, 1996).

Lewis has extended the idea of nested levels to the study of emotion and personality. He asks: How do we shift from being happy to sad when we are told of an unhappy event? How and why do moods settle in (e.g., depressions, contentment)? Why are some of us more prone to these moods than others? How do these happy and unhappy episodes and these moods create our personalities? How do our personalities create and play out in our emotional episodes, in our mood swings? Understanding emotion requires understanding how processes at different timescales influence each other. In a recent new theory of emotion and personality development,

Lewis (2000) likens the relationship between emotional episodes, moods, and personality to circular causality across different scales of analyses that characterize coastlines. The large-scale or macroscopic properties of a coastline—the bays, the ridges, the peninsulas—set the conditions for the small-scale or microscopic processes—waves, tidal forces, erosion. But these microscopic properties causally contribute to the long-standing macroscopic properties. This is an example of circular causality. Understanding emotion and personality development requires working out the same kind of circularly causal relationships—from the microscopic emotional states through the midscale of moods to the more stable personality. Table 6.1 summarizes Lewis's three scales of emotional development, showing parallels and distinctions across scales and the current understanding of the psychological and neurobiological mechanisms.

These developmental patterns fit the larger idea behind the landscape in Figure 6.8: The changing stability of patterns over many scales of time. Each line on the landscape represents the states of a behavioral pattern expressed as the collective variable; that is, the condensation of the multiple components into a simpler behavioral expression. Knowing the behavior of the collective variable is an essential first step in discovering the processes of change. But a more complete understanding also requires that we know about the behavior of the components that constitute the cooperative ensemble. This is especially important in developmental studies because the contributions and weights of these elements may themselves change over time and in different contexts. For example, leg mass and fat-to-muscle ratio may be potent contributors to behavioral expression of stepping at 2 months, but changes in these anatomical parameters may be far less important in the transition to independent walking at 12 months. At the later age, although infants need sufficient leg mass and strength to support their weight, the ability to maintain balance using vision and proprioception may be the critical component. Likewise, although focused attention may determine success in early stages of learning new skills, as skills become more automatic, the relative contribution of attention is diminished.

Because the components themselves have a developmental history and relationships among them are continually altered, a fuller representation of our dynamic landscape would look like Figure 6.10 That depiction shows three landscapes layered on top of one another, indicating that the components of the dynamic system themselves have a dynamic. The arrows connecting the layers show that the coupling between the components is complex and contingent, and may change over time. This means that the coupling is always multidirectional, and that effects of the subsystems on one another may cascade over time. To continue our infant stepping example, increasing leg muscle strength through activity in the first months of life facilitates standing, crawling, and walking. Independent locomotion induces change in spatial cognition, probably because as infants move around they pay more attention to their spatial landmarks (Acredolo, 1990; Bertenthal & Campos, 1990). But changes in cognition also feed back to locomotor behavior as more skilled infants explore and exploit more and different aspects of their spatial environment, change their motor planning, and are able to make rapid adjustments to unexpected events.

TABLE 6.1 Summary of Lewis's (2000) Proposed Nested Time Scales in Emotional Development

	Emotional Episode	Mood	Personality
Timescale	Seconds to minutes	Hours, days	Years
Description	Rapid convergence of cognitive interpretation with emotional state	Lasting entrainment of interpretative bias	Lasting interpretative-emotional habits
Dynamic system formalism	Attractor	Temporary modification of state space	Permanent structure of interpretative state space
Possible neurobiological mechanism	Cortical coherence mediated by orbitofrontal organization entrained with limbic circuits	Orbitofrontal-corticolimbic entrainment, motor rehearsal, and preafference, sustainded neurohormone	Selection and strengthening of some corticocortical and corticolimbic connections, pruning of others, loss of plasiticity
Higher order form	Intention, goal	Intentional orientation	Sense of self

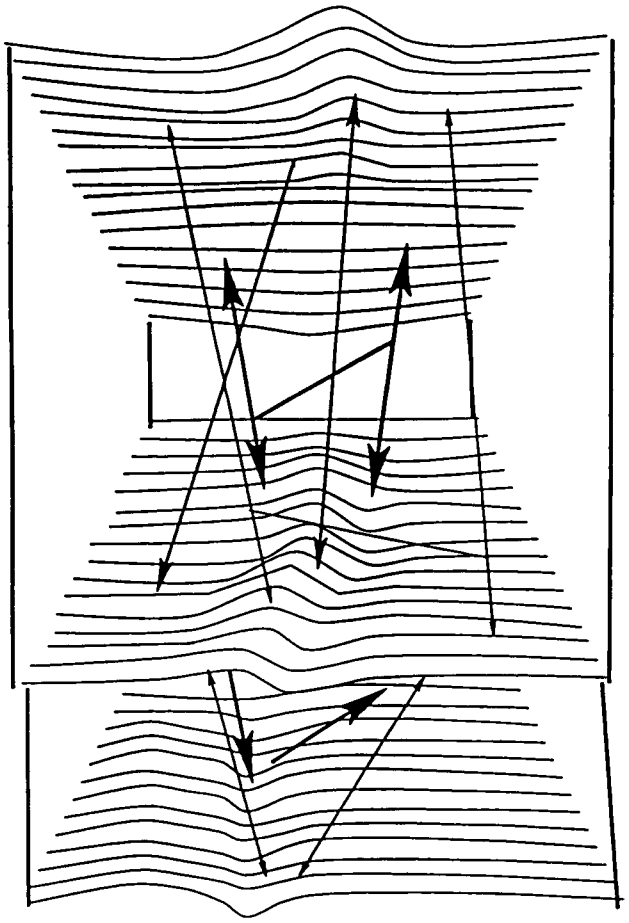


Figure 6.10 The epigenetic landscape as a multilayered system where the components mutually influence each other in changing ways.

Importantly, explanations at every level must be consistent and ultimately reconcilable. This is especially important when considering the neural basis of behavior. Since the time of Myrtle McGraw (1932), there has been a tradition in human developmental studies to seek explanation at the neural level, to look for some observed change in behavior *as caused* by a preceding and determining change in the brain. For example. Goldman-Rakic (1987) and others have suggested that massive reorganization of synaptic connections in the prefrontal cortex are the reason why 8- to 12-month-old infants show improvements in spatial cognition, inhibition of prepotent response tendencies, and even the onset of language. Thatcher and others seek to explain Piagetian stages as a result of stagelike changes in brain activity (Thatcher, 1991, 1992).

A successful search for the mechanisms of change during development may require *integration* of mechanisms at very different levels of organization. For example, by discovering that the deposition of body fat acts as a control parameter in the disappearance of newborn stepping, we have supplied a mechanism of change. A physiologist might ask about the metabolic processes that accelerate the deposition of fat in the postnatal period, and that could also constitute a process-based explanation of change. But the metabolic explanation should not be construed as any more basic and more real than one at any other level. Indeed, because levels and processes are mutually interactive, it is impossible to assign one level as the ultimate causation. Descriptions of change of many components are needed so that multilevel processes and their mutual interactions can be fully integrated.

Multicausality. Developing organisms are complex systems composed of very many individual elements embedded within, and open to, a complex environment. These components continuously interact with each other and in so doing change each other and the system as a whole. This is the idea of *multicausality.* As in many other complex systems in nature, such systems can exhibit coherent behavior: the parts are coordinated without an agent or a program that produces the organized pattern. Rather, the coherence is generated solely in the relationships between the organic components *and the constraints and opportunities of the environment.* This is the idea of an open system, one in which the environment (the task) is a component, equal to all others, in generating coherence. This self-organization means that no single element—internal or external—has causal priority. When such complex systems self-organize, they are characterized by the relative stability or instability of their states. Development can be envisioned as a series of evolving and dissolving patterns of varying dynamic stability, rather than an inevitable march toward maturity. Thus, crawling is a coherent behavior that infants use to locomote when they have sufficient strength and coordination to assume a hands-and-knees posture, an environment to support it and to motivate self-movement, but a system not yet balanced and strong enough to walk upright. Crawling is a stable behavior for several months. But when infants learn to walk, the crawling pattern becomes destabilized by the patterns of standing and walking. There is no program for crawling assembled in the genes or wired in the nervous system. It self-organizes as a solution to a problem in a task context (move across the room), later to be replaced by a more efficient solution.

Heterogeneous Systems and Degeneracy. These ideas about multicausality, self-organization, and openness fit emerging ideas about neural development. The brain is made up of many different parts and processes, but each is in continuous interaction with the other parts and, through the sensory-motor system, with the world (e.g., Churchland & Sejnowski, 1992; Crick, 1994; Damasio, 1994; Edelman, 1987; Huttenlocher, 2002; Kelso, 1995; Koch & Davis, 1994). The brain also has a property that Edelman (1987) calls *degeneracy,* which in neural structure means that any single function can be carried out by more than one configuration of neural signals and that different neural clusters also participate in a number of different functions. Degeneracy creates redundancy such that the system functions even with the loss of one component. For example, Bushnell (1994) states that because we encounter space through sight, sound, movement, touch, and even smell, we can know space even if we lack one modality. Being blind, for example, does not wipe out spatial concepts; instead, as studies of blind children show (e.g., Landau & Gleitman, 1985) comparable spatial concepts can be developed through different clusters of modalities.

Degeneracy also means that different systems can educate each other, without an external teacher. Careful observers of infants have long noted that they spend literally hours watching their own actions (e.g., Bushnell, 1994; Piaget, 1952)—holding their hands in front of their faces, watching as they turn them back and forth, and some months later, intently watching as they squeeze and release a cloth. This second characteristic of multimodality is what Edelman (1987) calls *reentry,* the explicit interrelating of multiple simultaneous representations across modalities. For example, when a person experiences an apple—and immediately characterizes it as such—the experience is visual but it also invokes the smell of the apple, its taste, feel, heft, and a constellation of sensations and movements associated with various actions on the apple. Importantly, these multimodal experiences are time locked and correlated.

Changes in the way the hand feels when it moves the apple are time locked with the changes one sees as the apple is moved. The time-locked correlations create a powerful learning mechanism, as illustrated in Figure 6.11, which shows four related mappings. One map is between the physical properties of the apple and the neuronal activity in the visual system. Another map is between the physical properties of the apple and neuronal activity in the haptic system. The third and fourth

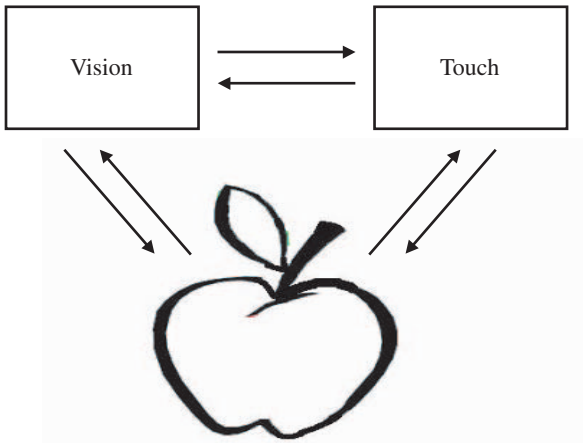


Figure 6.11 Illustration of the time-locked mappings of two sensory systems to the events in the world and to each other. Because visual and haptic systems actively collect information—by moving hands, by moving eyes, the arrows connecting these systems to each other also can serve as teaching signals for each other.

maps are what Edelman calls the *reentrant maps:* Activity in the visual system is mapped to the haptic system, and activity in the haptic system is mapped to the visual system. Thus the two independent mappings of the stimulus—the sight and the feel—provide qualitatively different glosses on the world, and by being correlated in real time, they educate each other. At the same time, the visual system is activated by time-varying changes in shading and texture and collinear movement of points on the apple, the haptic system is activated by time-locked changes in pressures and textures. At every step in real time, the activities in each of these heterogeneous processes are mapped to each other, enabling the system in its own activity to discover higher-order regularities that transcend particular modalities.

Experience-Dependent Plasticity. Neuroscientists have known for nearly half a century that the surface of the cerebral cortex contains maps of the sensory input and movements of various parts of the body arranged in roughly topographic order. The prevailing assumption was that these neatly ordered representations were established in early life by the maturation of the neural anatomy and remained static thereafter. These old truths have been discarded. In the past decade, it has been discovered that, in monkeys, these maps are established and maintained by function, and the adult brain has heretofore unimagined plasticity.

Brain plasticity has now been found not just in the somatosensory cortex, but also in somatic senses in subcortical areas and in the visual, auditory, and motor cortices in monkeys and other mammals (Kaas, 1991, see also Stein & Meredith, 1993). These demonstrations of adult plasticity are very important for understanding development because (a) they demonstrate that brain representations, even those that can be "geographically" located, are dynamic processes, and (b) they provide clues to the very processes by which development may take place.

The now classic experiments were performed by Merzenich and his colleagues on New World monkeys, which have relatively unfissured brains with a clear somatotopic representation of their sensitive hands. A painstaking mapping of the sensation on the finger and hand areas to electrophysiological responses on the cortical surface revealed detailed maps of adjacent areas that were similar, but not identical, in individual monkeys (Jenkins, Merzenich, & Recanzone, 1990). That these areas are plastic, not anatomically rigid, was demonstrated in several ways. First, when the experimenters amputated digits, the maps reorganized so that adjacent areas enlarged to fill in the finger spaces where input was eliminated. Second, when the Merzenich group fused two fingers of adult monkeys together, the monkeys' brains eliminated the boundaries between the digits, and the receptive fields overlapped. When the skin-fusion was surgically corrected, distinctive digit areas returned. Enhanced function of a single finger through training enlarged its cortical representation, which again could be reversed when training ceased. Finally, even when no experimental manipulations were imposed, borders of digit representations changed somewhat over time, presumably reflecting the immediate use history of the finger. These and other experiments revealed, in the words of Merzenich, Allard, and Jenkins (1990) that "*the specific details of cortical 'representations'—of the distributed, selective responses of cortical neurons—are established and are continually remodeled BY OUR EXPERIENCES throughout life*" (p. 195; emphasis and capitals in original).

We end this section with a point to an intriguing new idea: Synesthesia in adults is a remnant of the pervasive interconnectivity and exuberant multimodal nature of the developing brain. *Synesthesia* is defined as the regular involuntary experience of external, durable, and generic perceptions in senses not commonly associated with a certain stimulus (Harrison, 2001). For example, the letter A might be associated with red or the smell of the flowers. Not all possible cross-modal correspondences show up as synesthetic experiences. Instead, they tend to consist of perceiving colored letters or musical notes or colored sounds and tastes. Synesthesia was long considered psychological exotica (see Harrison, 2001) and not systematically investigated—in part because synesthetic experiences are so constrained to a few odd kinds of correspondences, highly individualistic (while some individuals might perceive a high C as orange, others might perceive it as blue), and because very few adults report such cross-modal sensory experiences. However, recent behavioral studies with adults show the psychological reality in phenomena such as pop-out effects in search tasks and recent imaging studies show the neural reality. There are growing suggestions (see Mondloch & Maurer, 2004) that these idiosyncratic synesthetic connections in adults are vestiges of the exuberant interconnectivity in the developmentally immature, an interconnectivity that plays an important role in developmental process, and in the creation of the seemingly separate sensory systems in mature organisms (see also Turkewitz, 1994).

Multimodal Processes in Cognitive Development. One demonstration of the developmental power of heterogenous systems coupled to each other and time locked to the world comes from a study of how babies come to understand transparency. Transparency is a problematic concept; think of birds who harm themselves by trying to fly through windows. Transparency is a problem because correlations between visual cues and the haptic cues that characterize most of our encounters with the world do not work in this case. So babies, like birds, are confused by transparency. In one study, Diamond (1990b) presented infants with toys hidden under boxes such that there was an opening on one side—as illustrated in Figure 6.12. These boxes were either

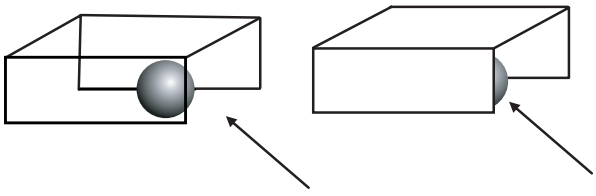


Figure 6.12 A toy (ball) hidden under a transparent box and an opaque box in the Diamond task. The opening is indicated by the arrow.

opaque—hiding the toy—or transparent so that the infants could see the toy under the box. The key result is that 9-month-old infants are better able to retrieve the toy from the opaque than from the transparent container. The problem with the transparent container is that infants attempt to reach for the toy directly, through the transparent surface, rather than searching for and finding the opening.

Infants readily solve this problem, however, if they are given experience with transparent containers. Titzer, Thelen, and Smith (2003) gave 8-month-old babies either a set of opaque or transparent buckets to play with at home. Parents were given no instructions other than to put these containers in the toy box, making them available to the infants during play. The infants were then tested in Diamond's task when they were 9 months old. The babies who had been given opaque containers failed to retrieve objects from transparent ones just as in the original Diamond study. However, infants who played with the transparent containers sought out and rapidly found the openings and retrieved the object from the transparent boxes.

Why? These babies in their play with the containers—in the inter-relation of seeing and touching—had learned to recognize the subtle visual cues that distinguish solid transparent surfaces from no surface whatsoever and had learned that surfaces with the visual properties of transparency are solid. The haptic cues from touching the transparent surfaces educated vision, and vision educated reaching and touch, enabling infants to find the openings in transparent containers. These results show how infants' multimodal experiences in the world create knowledge—about openings, object retrieval, and transparent surfaces.

Experimental studies of human cognition suggest that many concepts and processes may be inherently multimodal in ways that fit well with Edelman's idea of reentrance (e.g., Barsalou, 2005; Glenberg & Kaschak, 2002; Gogate, Walker-Andrews, & Bahrick, 2001; Lickliter, 1994; Richardson, Spivey, Barsalou, & McRae, 2003). One line of evidence for this conclusion is that even in tasks meant to be explicitly unimodal, multiple modalities contribute to performance. For example, *visual* object recognition appears to automatically activate the actions associated with the object. In one study, adults were shown a picture of a water pitcher such as that illustrated in Figure 6.13. The task was simple, to press a button indicating whether the object was a pitcher (yes) or it was not (no). Response time was the dependent measure. This is a purely visual object recognition task. Yet, the participants were much faster at recognizing the object if the button pressed to indicate the yes response was on the same side as the pitcher's handle, as if seeing the handle primed (and readied) the motor response of reaching to that side. Similar results have been reported with a wide variety of objects and in tasks using several different methods. In general, people are faster in visual recognition tasks when the response to be made is compatible with a real action on the object. These results tell us that visual recognition is a piece of, in the same internal language as, action. This is how it must be under the idea of reentrant mappings, where visual recognition is built out of and educated by its time-locked connections with actions on objects.

Figure 6.13 Illustration of the Tucker and Ellis task. On each trial the task is the same, to answer as rapidly as possible the question: "Is this a pitcher." Half the participants answer "yes" by pressing a button on the right and half by pressing a button on the left. Participants are faster when the handle is on the same side as the "yes" response.

Development as Selection. In an earlier section, we proposed very general principles of dynamic systems as a way of conceptualizing developmental change: Patterns assembled for task-specific purposes whose form and stability depended on both the immediate and more distant history of the system. We emphasized that a dynamic view meant that there must be continuity among the components of the system, both internal and external, and among the timescales over which the system lives. Contemporary discoveries of brain organization and function are highly consistent with these dynamic principles; indeed, they provide insights into the precise mechanisms of change.

Properties that point to development as a *selective* process indicate that the brain is a dynamic collective, with self-organizing and dynamic properties; it is designed to extract coherence from multiple, time-locked input; and its organization is maintained by function. In the following account, we rely heavily on Gerald Edelman's (1987) "theory of neuronal group selection" (TNGS) as the neural mechanism instantiating dynamic behavioral development.

Several additional assumptions are critical. First, it is assumed that genetic and epigenetic processes during neural embryology produce the global architecture of the brain (see Edelman, 1987, 1988). In that primary architecture, however, there is enormous variability in both the number of individual neurons and their connectivity. Second, connections between neurons and groups of neurons arise through use. Third, there is an overabundance of neurons and possible connections among them, and thus specificity arises through competition.

Imagine, then a newborn infant whose first experiences in the world include nursing at the breast. Associated with the perceptions of the baby's own movements of lips, jaws, tongue, and throat are the taste of the milk, the sight and smell of the mother's skin, the sound of her voice, and the whole body tactile experience of contact and warmth. Because of the degenerate and reentrant web of connections, these perceptions activate time-correlated groups of neurons meshed together, linking the patterns detected by the originally separate sensory systems. It is also highly likely that these perceptions are associated with neural nets from emotional and motivational centers that signal pleasurable feelings (Damasio, 1994; Edelman, 1987). With each suck and swallow, and repeated nursing episode, overlapping, but not identical, groups of neurons also become activated. Common assemblies become strengthened; less-used pathways become less stable. Because the structure is reentrant, common perceptual elements are extracted from these overlapping inputs that are marked by their correlations in real-world time. This mapping over heterogeneous input is the critical process; new relationships are excited and strengthened because they occur together.

With repetition, such a process of selection by function allows the newborn infant to recognize a constellation of features as a higher-order category: "Time to eat." But it is a dynamic category, invoked now by only partial and incomplete features—the nursing position, for example, or the sight and smell of mother, or the act of sucking itself—and it is continually updated as experience accumulates. When feeding is supplemented by a bottle, for instance, the category "time to eat" may be enlarged to include the perceptual qualities of the bottle and an adjustment in the sucking movements to accommodate changes in the nipple. Higher-order knowledge about feeding, object properties, and the behavior of other humans is thus built by selection through everyday activities—looking, moving, hearing, and touching.

Edelman (1987) clearly follows Piaget (1952) in believing that these early perception-action categories are the cornerstone of development. In particular, the emergence of categories is a specific case of dynamic pattern formation. The task facing newborn infants is to reduce the degrees of freedom at many levels: In the external world—the potentially indeterminate nature of the stimuli—this is done by forming perceptual categories; and in the internal world—the equally indeterminate nature of the multiple joints and muscles—this is done by seeking patterns of motor coordination and control. At the same time, and most important, they must match their internal dynamics to those of the world around them; they must make their perceptual categories and their action categories congruent to function in flexible, adaptive ways. In our dynamic approach, perception, action, and cognition are not disjointed; they are part of a singular process.

Thus, we believe that whether we choose the term *pattern formation,* or *coordination,* or *category acquisition,* we are referring to the same dynamic processes whereby complex heterogeneous elements self-organize to produce coherence in time and space. Dynamic patterns can be fleeting or very stable, but, most important, they are time dependent and seamless. By *time dependent,* we mean that each event in the brain and body has a here-and-now, a history, and an effect on the future. By *seamless,* we mean that these time domains are themselves without interruption. The stuff of development is the dynamics of perception, action, and cognition in real time. What the infant sees, thinks, and does in the present provides the aliment for what the child is in the future, just as what the child did in the past is the substrate for how he or she sees, thinks, and acts right now. Thus, we can envision the neuronal processes postulated by TNGS as a specific form of dynamic pattern formation, with the patterns being the categories of perception and action that form the developmental core of higher mental functions and the patterns of thought that

become increasingly complex and generalized throughout infancy and childhood.

Exploration. How can a learner *who does not know what there is to learn* manage to learn anyway? This is a more difficult question than it might first appear. The issue is whether one needs to prespecify the learning tasks and the learning goals, whether the agent or its designer has to know what needs to be learned to learn. Evidence from human development gets us out of this quandary by showing that babies can discover both the tasks to be learned and the solution to those tasks through exploration, or nongoal-directed action. In babies, spontaneous movement creates both tasks and opportunities for learning. One demonstration concerns the study of reaching (Corbetta & Thelen, 1996). The week-by-week development of four babies was tracked over a 3-month period as they transitioned from not reaching to reaching. Four very different patterns of development were observed. Some babies in the nonreaching period hardly lifted their arms at all, but sat placidly watching the world. Other babies were more high-strung and active, flailing and flapping and always moving. These different babies had to learn to solve very different problems to learn to reach out and grasp an object. The flailer would have to learn to become less active, to lower his hands, to bring them into midline. The placid baby would have to learn to be more active, to raise her hands, to lift them up from their usual positions on her side. Each baby did learn, finding a solution that began with exploration of the movement space.

The course of learning for each baby appeared to be one of arousal, exploration, and the selection of solutions from that exploration space. In basic form, the developmental pattern is this: The presentation of an enticing toy is arousing and elicits all sorts of nonproductive actions, and very different individual actions in different babies. These actions are first, quite literally, all over the place with no clear coherence in form or direction. But by acting, by movements that explore the whole range of the movement space, each baby in his or her own unique fashion, sooner or later makes contact with the toy—banging into or brushing against it or swiping it. These moments of contact select some movements in this space, carving out patterns that are then repeated with increasing frequency. Over weeks, the cycle repeats—arousal by the sight of some toy, action, and occasional contact. Over cycles, increasingly stable, more efficient and more effective forms of reaching emerge. What is remarkable in the developmental patterns of the children is that each found a solution—and eventually converged to highly similar solutions—by following individually different developmental pathways. As they explored different movements—in their uncontrolled actions initiated by the arousing sight of the toy—they each discovered initially different patterns, each had a different developmental task to solve. The lesson for building intelligent agents is clear: A multimodal system that builds reentrant maps from time-locked correlations only needs to be set in motion, to move about broadly, even randomly, to learn and through such exploration to discover both tasks and solutions.

The power of movement as a means for exploration is also illustrated by an experimental procedure known as "infant conjugate reinforcement" (Rovee-Collier & Hayne, 1987). Infants (as young as 3 months) are placed on their backs and their ankles are attached by a ribbon to a mobile which is suspended overhead. Infants, of course, *through their own* actions, discover this link. As the infants kick their feet, at first spontaneously, they activate the mobile. In *a few minutes,* they learn the contingency between their foot kicks and the jiggling of the mobile, which presents interesting sights and sounds. The mobile responds conjugately to the infants' actions: The more infants kick and the more vigorously they move, the more motion and sound they produce in the mobile. In this situation, infants increase their kicking to above the baseline spontaneous levels apparent when babies simply look at a nonmoving mobile. Infants' behavior as they discover their control is one of initial exploration of a wide variety of actions and the selection of the optimal pattern to make the interesting events—the movement of the mobile—occur.

Although this is an experimental task, and not an everyday real-world one, it is a very appropriate model for real-world learning. The mobile provides the infant with many time-locked patterns of correlations. More important, infants themselves discover the relations through their own exploratory movement patterns. The infants themselves are moving contingently with the mobile; the faster and harder they kick, the more vigorously the mobile jiggles and sways. This is for infants a highly engaging task; they smile and laugh and often become angry when the contingency is removed. Thus, the experimental procedure *like the world* provides complex, diverse, and never exactly repeating events yet all *per-*

fectly time locked with infants' own actions. And it is exploration, spontaneous nontask-related movement, that starts the process off. Without spontaneous movement, without exploration, there is nothing to learn from the mobile.

Young mammals—including children—spend a lot of time in behavior with no apparent goal. They move, they jiggle, they run around, they bounce things and throw them, and generally abuse them in ways that seem, to mature minds, to have no good use. However, this behavior, commonly called play, is essential to building inventive forms of intelligence that are open to new solutions.

Embodiment. Nervous system are in bodies—and it is through the body the nervous system is connected to (both affecting and being affected by) the world. There is increasing recognition and research on the ways in which cognition—and development—are deeply and completely the product of our continued interaction with the physical world through our bodies. This attention to the body's role in cognition is seen in the study of language (e.g., Glenberg & Kaschak, 2002; Lakoff & Johnson, 1980), in problem solving and memory (Richardson & Spivey, 2000), in joint attention and intention reading (Yu & Ballard, 2004), and in new approaches to a developmental artificial intelligence (Pfeiffer & Scheier, 1999). A key idea in this literature is that cognition does not just reside in organisms, but resides in their coupled interactions with the world (an idea that is also the heart of Gibsonian approaches to perception; see, Gibson, 1979).

One developmental implication is that the physical world serves as a crucial mechanism in developmental process itself. Not all knowledge needs to be put into the head, dedicated mechanisms, or representations. Some knowledge can be realized in the body, a fact dramatically illustrated by passive walkers. Knowledge of the alternating limb movement of bipedal locomotion—knowledge traditionally attributed to a central pattern generator—appears to reside in the dynamics of two coupled pendulums (McGeer, 1990). Some of our intelligence also appears to be in the interface between the body and the world. The phenomenon of change blindness is often conceptualized in this way. People do not remember the details of what is right before their eyes because they do not need to remember what they can merely look at and see (O'Regan & Noë, 2001). Similarly, Ballard and colleagues (Ballard, Hayhoe, Pook, & Rao, 1997) have shown that in tasks in which people are asked to rearrange arrays of squares, they off-load their short-term memory to the world (when they can). This off-loading in the interface between body and world appears to be a pervasive aspect of human cognition and may be critical to the development of higher-level cognitive functions or in the binding of mental contents that are separated in time.

Smith (2005) has recently reported evidence on how the body—and the body's continuous coupling to events in the world—may play a key role in word learning. The experimental procedure derives from a task first used by Baldwin (1993) and illustrated in Figure 6.14. The participating subjects are very young children 1.5 to 2 years of age. The experimenter sits before a child at a table, and presents the child with one object to play with and then with a second. Out of sight of the child, the two objects are then put into containers and the two containers are placed on the table. The experimenter looks into one container and says, "I see a dax in here." The experimenter does not show the child the object in the container. Later the objects are retrieved from the containers and the child is asked which one is a dax. Notice that the name and the object were never jointly experienced. How then can the child join the object name to the right object? Baldwin showed that children as young as 24 months could do this, taking the name to refer to the *unseen* object that had been in the bucket at the same time the name was offered. How did children do this? How, if

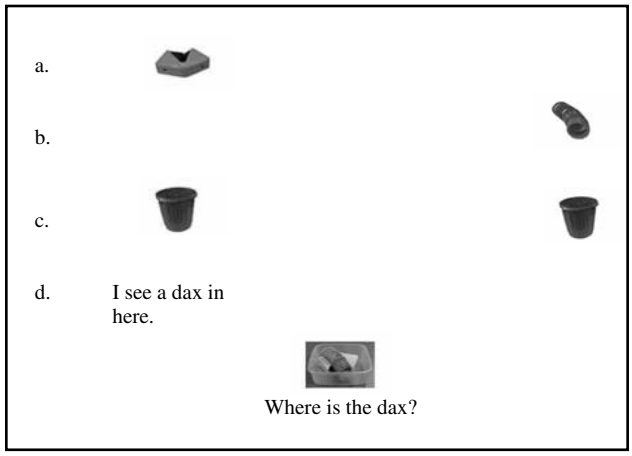


Figure 6.14 A schematic illustration of the course of events in the A-not-B task. After the delay, the hiding box is moved forward allowing the infant to reach and search for the hidden toy.

one were building an artificial device, would you construct a device that could do this, that could know the name applied to an object not physically present when the name was offered?

There are a number of solutions that one might try, including reasoning and remembering about which objects came out of which containers and about the likely intentions of speakers when they offer names. Smith showed, however, that young children solve this problem in a much simpler way, exploiting the link between objects and locations and space. What children do in this task is make use of a deep and foundationally important regularity in the world: a real object is perceptually distinguished from others based on its unique location; it must be a different place from any other object. The key factor in the Baldwin task is that in the first part of the experimental procedure, one object is presented on the right, the other on the left. The containers are also presented the same way and the name is presented with the experimenter looking into one bucket or at one location, for example, on the right. The child solves this task by linking the name to the object associated with that location. We know this is the case because we can modify the experiment in several crucial ways. For example, one does not need containers or hidden objects to get the result. One can merely present the target object on the right and have children attend to and play with it there, then present the distracter object on the left and have children attend to and play with it there. Then, with all objects removed, with only an empty and uniform table surface in view, one can direct children's attention to the right and offer the name (dax) or to the left and offer the name. Children consistently and reliably link the name to the object that had been at this location.

Young children's solution to this task is simple, a trick in a sense, that makes very young children look smarter than they perhaps really are. But it is a trick that will work in many tasks. Linking objects to locations and then directing attention to that location to link related events to that object provides an easy way to bind objects and predicates (Ballard et al., 1997). People routinely, and apparently unconsciously, gesture with one hand when speaking of the protagonist in a story, but with the other hand when speaking of the antagonist. By hand gestures and direction of attention, they link events in a story to the characters. American Sign Language formally uses space in this way in its system of pronouns. People also use space as a mnemonic, looking in the direction of a past event to help remember that event. One experimental task that shows this is the "Hollywood Squares" experiments of Richardson and Spivey (2000). People were presented at different times with four different videos, each from a distinct spatial location. Later, with no videos present, the subjects were asked about the content of those videos. Eye tracking cameras recorded where people looked when answering these questions and the results showed that they systematically looked in the direction where the relevant information had been previously presented.

This is all related to the idea of *deictic pointers* (Ballard et al., 1997; Hurford, 2003) and is one strong example of how sensory-motor behaviors—where one looks, what one sees, where one acts—create coherence in our cognition system, binding together related cognitive contents and keeping them separate from other distinct contents. In sum, one does not necessarily need much content-relevant knowledge or inferential systems to connect one idea to another. Instead, there is a easier way; by using the world and the body's pointers *to that world.*

An emerging field pertinent to these ideas of embodiment is epigenetic robotics (Zlatev & Balkenius, 2001). This field results from the mutual rapprochement of developmental psychology and robotics, with a focus on the *prolonged epigenetic process through which increasingly more complex cognitive structures emerge in the system as a result of interactions with the physical and social environment* (Zlatev & Balkenius, 2001). Epigenetic robotics emphasizes three key ideas relevant to developmental processes in biological and artificial systems:

1. The *embodiment* of the system
2. Its *situatedness* in a physical and social environment
3. A prolonged *epigenetic developmental process* through which increasingly more complex cognitive structures emerge in the system as a result of interactions with the physical and social environment

This new interdisciplinary developmental research purposely borrows the term *epigenesis* from Piaget to development determined primarily by the *interaction* between the organism and the environment, rather than by genes. Current research within this field does not just emphasize sensorimotor interactions but also social processes with particular attention to the ideas of Vygotsky (1962). Current topics of study within epigenetic robotics that should be of interest to developmental psychologists are joint attention (Björne & Balkenius, 2004), imitation (Schaal, 1999), and observational

learning (Breazeal, Buchsbaum, Gray, Gatenby, & Blumberg, 2005).

From Theory to Practice: A Dynamic Systems Approach to Research

The strength of a dynamic approach is its great generality and thus its potential application across many domains and levels of analysis. For instance, a dynamic approach to development is more a way of thinking about development than a specific theory of, say, personality or the acquisition of formal reasoning. However, a dynamic approach does suggest a powerful research strategy for investigating particular domains. We first summarize the principle steps in a dynamic strategy, and then we illustrate an application of this approach to the development of a fundamental motor skill.

Recall that the essential issues are the stability of the system, as indexed by the behavior of some collective measure of the multiple components, and the changes in stability over time. According to dynamic principles, transitions to new forms involve the loss of stability that enable the formation of new self-organized patterns. At transitions, systems may reveal which of their components is a control parameter or a critical element in change. Thelen and Smith (1994) outlined a series of explicit steps for research design, which are detailed in the following subsections.

Identify the Collective Variable of Interest. In a dynamic system, one or two variables can be identified that capture the degrees of freedom of a multidimensional system. In a development study, the goal is to describe the changes in this collective variable over time. It is not easy to find a collective variable over time or in a nonlinear, changing system. Performance measures at one age may not have the same meaning at a later age because the components of the system, and the relations between them, change. But this is a problem of any study over time, whatever the theoretical motivation.

One important criterion of a collective variable is that it should be a well-defined and observable variable, not a derived construct. Whereas "number of words in the lexicon" is operationally specific, "language processing capability" is not, because it cannot be defined outside of some other concrete behavioral measures. In some behavioral studies, the appropriate collective variable may be a *relationship*—the timing between a stimulus and a response, between movements of different parts of the body, or mutual turn taking during a social dialogue.

Characterize the Behavioral Attractor States. Before beginning a study of change, it is important to understand the preferred states of the collective variable at different points in time and over different conditions. Here is where cross-sectional studies can be very useful. Sometimes, it is most helpful to know how skilled adults or children perform the tasks under varying conditions such as differing speed, accuracy, or spatial demands. It is also critical to sample the stability of the system at different ages, to pick appropriate timescales in a developmental study. If there are big differences between 8 and 12 months, for instance, and very little change after 12 months, intensive study would be directed toward the time of rapid transition.

As we mentioned earlier, the stability of a behavioral attractor is indexed by its variability around an average value: How easily it is perturbed and how quickly the system returns to a stable configuration after perturbation. Performance that varies greatly within the same individual and is easily thrown off course indicates that the attractor state is weak. Conversely, when performance converges on a stable value, especially from different initial conditions and in the presence of distractors and other perturbations, the attractor well is deep.

Describe the Dynamic Trajectory of the Collective Variable. The heart of a dynamic analysis is a map of the stability of the collective variable. A crucial assumption in a dynamic strategy is that the individual (or the family unit) and any behavioral changes over time are the fundamental unit of study. It is common in developmental studies to compare groups of children at different ages and infer development from age-related differences in average group performance. Such cross-sectional studies are important for delimiting the boundaries of change, but they cannot inform about the processes that engender change. The essential nonlinear nature of dynamic systems means that attractors pull in trajectories from a variety of initial positions. This means that children may end up with similar behavior from very different starting points. At the same time, even very small differences in the initial conditions can lead to widely disparate outcomes (Figure 6.7). Group averages cannot disambiguate these pathways; the underlying developmental mechanisms may be profoundly different (or remarkably similar).

Thus, understanding developmental trajectories requires longitudinal study of individuals at appropriately dense sampling intervals to capture the timescale of

relevant change. In infancy, for instance, when new behaviors appear almost daily, even weekly observations may miss the critical transitions. Later in life, transitions may be relatively prolonged and much less frequent measures are needed.

Longitudinal studies are designed to probe the stability of systems over time; however, we are really testing systems over two related timescales. The obvious one is change over age or developmental time. Less explicit is the real time of the experimental task. By assessing performance over various trials and conditions within the single experimental session, we ask about the minute-to-minute dynamics. Thus, the history of the system *within the experimental session* may be very important. Effects of the number of trials and their order are also indexes of the system's stability. Does performance change after many repetitions, or is it stable whatever the preceding tasks?

Probing these two timescales is important because they must be inextricably interwoven in real life: When we observe infants and children at any point in time, their behavior reflects *both* their long-term developmental history *and* their immediate history within the task session. Likewise, developmental changes reflect children's repeated everyday experiences, which themselves modulate performance dynamics. It is useful therefore to consider the participants' *intrinsic dynamics,* or histories, as the background on which the experimental tasks are imposed: The intrinsic dynamics are the preferred stability landscapes, given previous history and organic conditions.

Identify Points of Transition. Transitions can be qualitative shifts to new forms, such as the first word spoken or the ability to do a transitive inference task, or they can be quantitative changes in the collective variable such as a shift in speed or the accuracy of a task. Transitions are critical because when a system is in transition its mechanisms of change can be identified and manipulated. Stable systems do not change; only when the coherence of the components is weakened are the components able to reorganize into a more stable form.

The branch of dynamics known as *catastrophe theory* is particularly concerned with sudden shifts from one form to another. These sudden jumps are associated with a number of *catastrophe flags* or indicators of shifts without intermediate forms. As discussed earlier, van der Maas and Molenaar (1992) have applied catastrophe theory to Piagetian conservation tasks to ask whether the shift from nonconservation to conservation can be explained by a catastrophe model. Although they did not find strong evidence for a number of the flags, the flags are useful indexes of systems in transition. The flags are:

- *Bimodal score distribution:* Performance is either on or off, without intermediate forms.
- *Inaccessibility:* Related to bimodality; intermediate states are not accessible, they are unstable and rarely seen.
- *Sudden jumps:* People switch from one form to another rapidly without intermediate states.
- *Hysteresis:* The dependence of performance on the immediately past performance. For example, responses might be different when the task is speeded up through a range of speeds as compared to when it is slowed down through the same range.
- *Divergence:* The system may respond differently to changes in different control variables.
- *Divergence of linear response:* Nonlinearity suggests that a small change in a control variable or perturbation can lead to a large effect.
- *Delayed recovery of equilibrium:* From earlier terminology, a slow relaxation time after a perturbation.
- *Anomalous variance:* Increased and unusual variability.

Identify Potential Control Parameters

The purpose of mapping the dynamics of the collective variable is to discover when systems change. The next step is to find out how and why they change. What are the organic, behavioral, or environmental factors that engender developmental shifts?

Thoughtful experimental design is needed to identify potential control parameters. In some cases, the possible agents of change are fairly obvious; for example, practice facilitates learning to ride a bicycle or doing arithmetic. But, in many instances of developmental change, the critical processes and events are nonobvious and may indeed be in components that seem at first only incidental, or so commonplace as to be overlooked. West and King's (1996) study of songbird learning, described in an earlier section, is a good example: Female cowbirds' subtle wing flicks are critical determinants of male song development. Another example is Thelen and Ulrich's (1991) description of treadmill stepping in infants, where improvements in treadmill stepping were related to overall changes in dominant muscle tone.

One way to help discover relevant control variables—in addition to informed guesses—is to actually measure changes in a number of system variables along with the collective variable. Thus, if the behavior of interest is, say, object retrieval in infants, a collective variable might be correct retrievals of a hidden object. But because retrieval performance is a collective of many other processes that may contribute to change, independent, then concomitant measures of visual attention or of memory, for instance, may reveal correlated jumps and plateaus.

Instability in the collective variable reveals points of transition. Thus, Gershkoff-Stowe and Smith (1997) mapped children's word retrieval errors as a function of the rapid vocabulary growth characteristic of the period between 15 and 24 months. During this time, individual children's retrieval of known object names showed a brief (3- to 6-week) period of disruption. Children would point to a well-known object (say, *cat*) that they had named correctly many times in the past and misname it (e.g., *duck*). This transient disruption in lexical access was temporally related in individual children to an increased rate of new word productions, suggesting that the rate of new words being added to the lexicon is the control parameter for these word retrieval processes, and, thus, the driver of developmental change in lexical access processes.

Traditionally, variability in behavioral data is a researcher's nightmare. Too much within- or between-subject variability swamps any experimental effects. Thus, researchers deliberately choose tasks to make people look alike. But behavior in real children is not like that, it is notably fragile and context dependent. Abilities seemingly come and go, and even skilled adults might perform tasks differently each time (Yan & Fischer, 2002). Dynamic systems theory turns variability from a scourge into a blessing. In dynamic systems theory, the metric is not whether a child has some static ability or unchanging concept. Rather, as systems are always in flux, the important dimension is the relative stability of behavior in context over time (van Geert, 2000). New measures of variability allow researchers to see trajectories of change over the short timescales of problem solving or over a longer developmental span. For example, Yan and Fischer (2002) tracked adults learning a new computer program and found that the performance of each person varied, but that the patterns of variability differed between novices and experts. Also, De Weerth and van Geert (2002) collected dense longitudinal samples of basal cortisol in infants and their mothers. Cortisol levels in infants decreased with age and did not show circadian rhythms, but each infant had great variability from measurement to measurement. Mothers, conversely, were individually very stable, but differed from each other more than infant to infant.

Manipulate Putative Control Parameters to Experimentally Generate Transitions. Mapping the dynamics of the collective variable and other components only provides suggestive and correlational evidence for possible control parameters. More convincing is to generate developmental transitions on a real or developmental timescale by manipulating the suggested control parameters. These simulations of developmental change work at points of transition because the system is not stable and thus is amenable to being affected by interventions.

It is of both theoretical and practical importance to know when interventions are effective in a developing system and when established behavior is so firmly entrenched that intervention is difficult. The Head Start program, for example, was targeted to the early preschool years because researchers discovered that enrichment was less potent with older children whose educational habits were already formed. Once a sensitive period is determined, developmental control parameters can be tested by providing specific interventions that may engender long-range behavioral change. For ethical reasons, these interventions are usually enrichments.

In the example discussed earlier, Titzer et al. (2003; see also Smith & Gasser, 2005) accelerated infants' abilities to retrieve objects from transparent containers by providing them with a variety of Plexiglas boxes to play with at home. Normally, 10-month-old infants have difficulty with the seemingly simple task of retrieving a toy from a Plexiglas box when the opening of the box is on the side. Although the toy is in full view, infants reach in their direct line of sight—smack into the Plexiglas—and not into the box opening. Titzer et al. reasoned that, because infants lacked experience with the properties of transparency, they relied on their usual pattern of reaching straight to what they see. The control parameter for developmental change was the repeated handling of transparent containers and learning about objects that could be seen through but not reached through. The experimenters provided 8-month-old infants with varied transparent containers and told the

parents to allow their children to play with the containers for 10 minutes twice a day, with no other specific instructions. By 9 months of age, infants in the experimental group were more facile in retrieving toys than a control group of 10 months of age who did not have enriched experience. Enriched experience pushed the system into new forms.

In a similar vein, Gershkoff-Stowe and Smith (1997) used training to investigate the disruption observed in word retrieval errors, which we described earlier. These authors reasoned that the disruption in word retrieval with accelerated vocabulary growth was the product of a lexicon crowded with many new and unstable additions. If the retrieval of words in a newly crowded lexicon is easily disrupted because word retrieval is relatively unpracticed, then naming errors during this period should decrease with practice at word retrieval. Here, the control parameter for developmental change was the repeated seeing and naming of objects by the child. These experimenters provided 17-month-olds with extra practice in producing one set of object names. When these children's rate of productive vocabulary began to accelerate, the researchers observed increased word retrieval errors for many known words but not for the words that had received extra training. This training study demonstrates how seeing and naming objects may be the cause of more stable and less perturbable lexical retrieval, and how the activity of the system itself may be the cause of developmental change.

Equally as informative as long-term interventions for testing control parameters are what Vygotsky (1962) called *microgenesis* experiments (e.g., Kuhn & Phelps, 1982; Siegler & Jenkins, 1989). The experimenters try to push children into more mature performance by manipulating possible control parameters over a shorter time period, sometimes within an experimental session. For example, Thelen, Fisher, and Ridley-Johnson (1984) tested their hypothesis that the control parameter for the "disappearance" of the well-known newborn stepping response was the rapid deposition of subcutaneous fat, making the baby's legs relatively heavy. If, they reasoned, the weight of the legs was critical for whether babies stepped or not, changing leg weights should mimic developmental changes, and indeed it did. Decreasing the mechanical load on the legs by submerging the legs in water increased stepping, and adding weights decreased the response.

We emphasize again that many developmental studies manipulate potential control parameters. Those that provide training, enrichment, or increased parental support hope to show more advanced performance; those that increase attentional or processing demands or offer ambiguous stimuli or distractions will demonstrate less skilled actions. What is different about a dynamic systems approach is the situating of these experiments in the larger context of the overall collective dynamics so that principled decisions can be made on when and what to manipulate in experimental sessions. In the previous examples, the interventions worked because the experimenters knew from other data that the children were in periods of rapid change.

In the following section, we report on a developmental study designed and conducted using these explicit dynamic systems principles. We demonstrate that a dynamic perspective revealed change processes that were not discovered from conventional approaches.

A Dynamic Systems Approach to Learning to Reach

Reaching for and grasping objects is a foundational perceptual-motor skill that is critical for normal human functioning. Normal infants first reach out and grab things they see when they are 3- to 4-months-old. At first, their coordination and control are poor; they often miss their targets, and their movements are jerky and indirect. Within a few months, they become much more skilled, and by the end of the first year, they can grab things off the supermarket shelves as they are wheeled by in shopping carts.

The pioneering work of Halverson (1931, 1933) and especially of von Hofsten (1991) has documented that, within those first months of reaching onset, infants' reaches become more accurate, straighter, and smoother. But the developmental processes involved in the emergence of the skill and its improvement have remained little understood. Reaching is a function of many component structures and processes, including the physiological, metabolic, and biomechanical properties of the muscles and joints, the state of the central nervous system, vision and visual attention, motivation, and so on. All of these elements are changing during the first year of life—some, at a rather rapid rate. What are the control parameters that move the system into new states?

To begin to understand these processes, Thelen and her colleagues designed a study of the emergence of reaching using explicit dynamic systems principles. The focus was on reaching as an emergent perceptual-motor pattern acquired throughout the soft assembly of mutually interacting with multiple components within a con-

text. All of the components are essential for the skill to emerge and improve, but one or more components may act as control parameters at different points during development. The overall design was to measure behavior repeatedly and intensively in a small number of children at multiple levels (from behavioral to patterns of muscle activation) and at multiple timescales (real time and developmental time).

The study involved four infants, Nathan, Gabriel, Justin, and Hannah, whose reaching and nonreaching arm movements were observed weekly from 3 weeks until 30 weeks, and in alternating weeks thereafter. The study tracked *multiple components* in looking at reaching performance: The kinematics (time-space parameters) of the movement trajectories, the coordination between the arms, and underlying torque or force patterns moving the joints, the patterns of muscle activation that generate the forces, and the everyday postural and motor states of the baby. In addition, the study addressed *multiple timescales.* Each week, the experimenters presented the infants with attractive objects in such a way that the reach was embedded within a larger session, and motor variables were recorded so that the transition from nonreaching movements to reaching could be captured. Thus, they recorded transitions on two timescales: (1) the real time of the trial where the toy was presented, and (2) the developmental timescale, where patterns of stability may evolve and dissolve.

Collective Variable Dynamics. The first step in a dynamic systems approach is to define a reasonable collective variable or variables—measures that capture the state of the system and its developmental changes. Previous descriptions (e.g., Fetters & Todd, 1987; Mathew & Cook, 1990; von Hofsten, 1991) suggested that improvement in reaching could be described by two measures of the path of the hand to the offered toy: Its straightness and its smoothness. A straight-hand path takes the shortest distance from the start of the movement to the target: Adults' hands move in a very nearly straight path for direct reaches. Smoothness is a measure of how often the movement starts and stops or slows down and speeds up. Infants' jerky movements have many "speed bumps" characterized by accelerations and decelerations. In contrast, adults' movements toward a direct target show only one acceleration and one deceleration.

The developmental dynamics of these two collective variables for the four infants are depicted in Figure 6.15 (Thelen, Corbetta, & Spencer, 1996). Overall, the infants became better reachers; they converged on relatively straight and smooth hand paths by the end of the first year. These performance results are consistent with previous reports showing improvement with age (von Hofsten, 1991). But the picture revealed by this dense longitudinal study is much richer, and more surprising, than that painted by previous work.

Most notably, the dynamics of reaching performance over the first year were highly nonlinear (in contrast to the seemingly linear improvement revealed by less dense and group data). First, infants differed dramatically in the age of the first transition (from no reaching to reaching). Whereas Nathan reached first at 12 weeks, Hannah and Justin did not attain this milestone until 20 weeks of age. Second, the infants showed periods of rapid change, plateaus, and even regressions in performance. All infants were poor reachers at first. But three of the four infants—Nathan, Hannah, and Gabriel—also showed an epoch where straightness and smoothness appeared to get worse after some improvement (labeled as A in Figure 6.16). Finally, there was in Nathan, Justin, and Hannah a rather discontinuous shift to better, less variable performance (indicated by T in Figure 6.16 on p. 295). Gabriel's transition to stability was more gradual, but clearly nonlinear overall. These phase shifts to different states were confirmed statistically.

The developmental course of reaching looks very different when the individual trajectories of change are plotted using dense sampling. Although all four infants converged on remarkably similar values by 1 year, they did not get there by identical means. Can these collective variables dynamics provide insight to the processes underlying the onset and improvement of reaching? Are there control variables that are common to all four infants? What accounts for their individual differences?

The First Transition: The Onset of Reaching. The longitudinal design allowed Thelen and colleagues to pinpoint with some accuracy the first phase shift, the appearance of successful reaching for and contacting the offered toy. (Note that these weeks of onset were confirmed by the more naturalist observations of these babies.) Having identified a developmental transition, the next step in a dynamic approach was to look for potential control parameters. Recall that we make strong assumptions of continuity across levels and timescales; discontinuities must arise from, and be part of, these continuous dynamics.

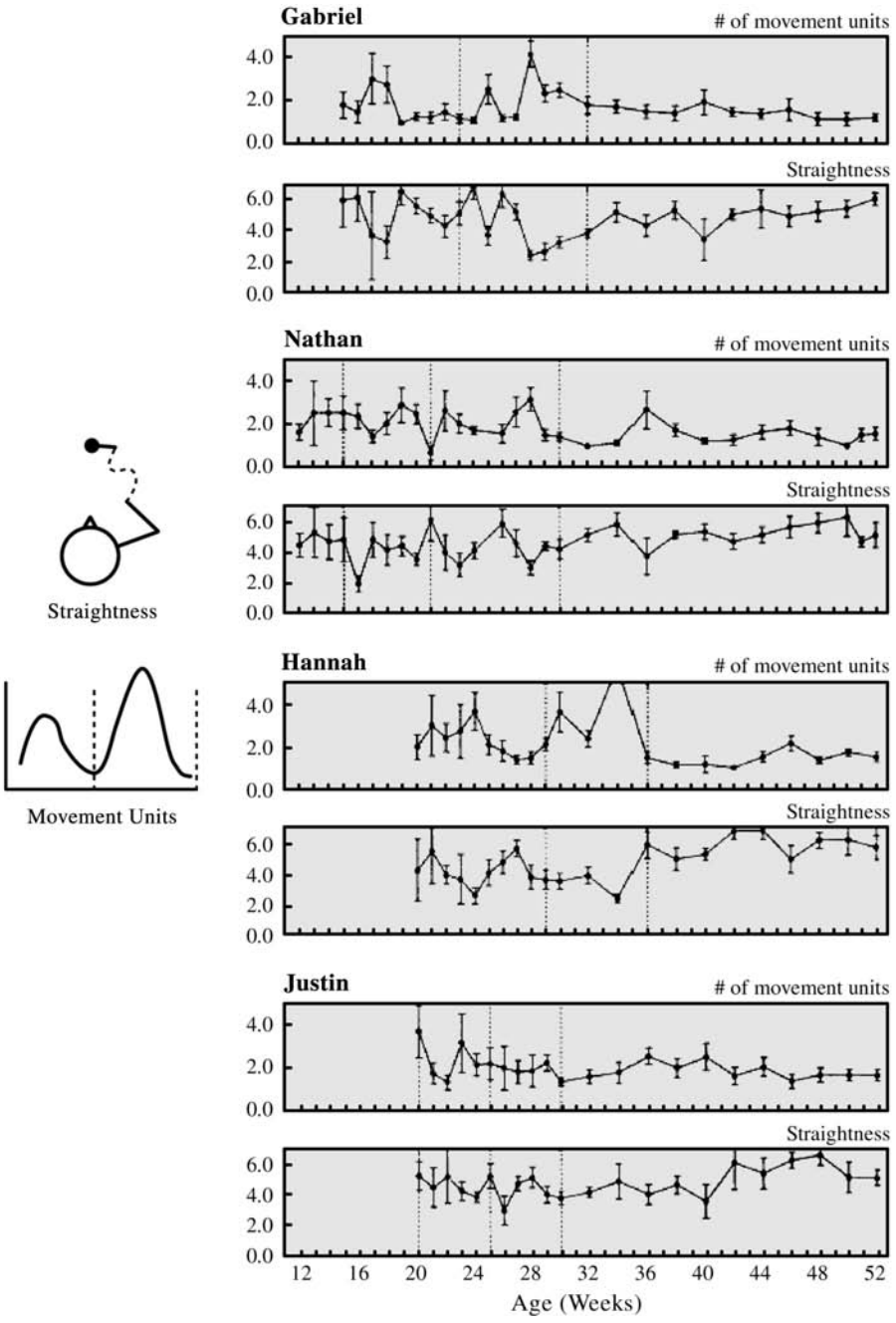


Figure 6.15 Changes in the straightness and smoothness of reach trajectories of four infants followed longitudinally over the first year. The collective variables are number of movement units (fewer = a smoother reach) and straightness index, where a value of 1 = perfectly straight from start to target. *Source:* From "The Development of Reaching during the First Year: The Role of Movement Speed," by E. Thelen, D. Corbetta, and J. Spencer, 1996, *Journal of Experimental Psychology: Human Perception and Performance, 22,* pp. 1059–1076. Copyright 1996 by the American Psychological Association. Reprinted with permissions.

What is continuous for young infants is that they are always moving their limbs, from birth and even before. Reaching, the new form, must emerge from the continuous processes of moving and perceiving that occur before infants perform the first goal-directed reach—and that continue as nonreaching arm movements even after this new behavior appears. Thelen et al. (1993) looked at the transition to first reaching as a process of infants' "discovering" a reach from among many and varied nonreaching movements.

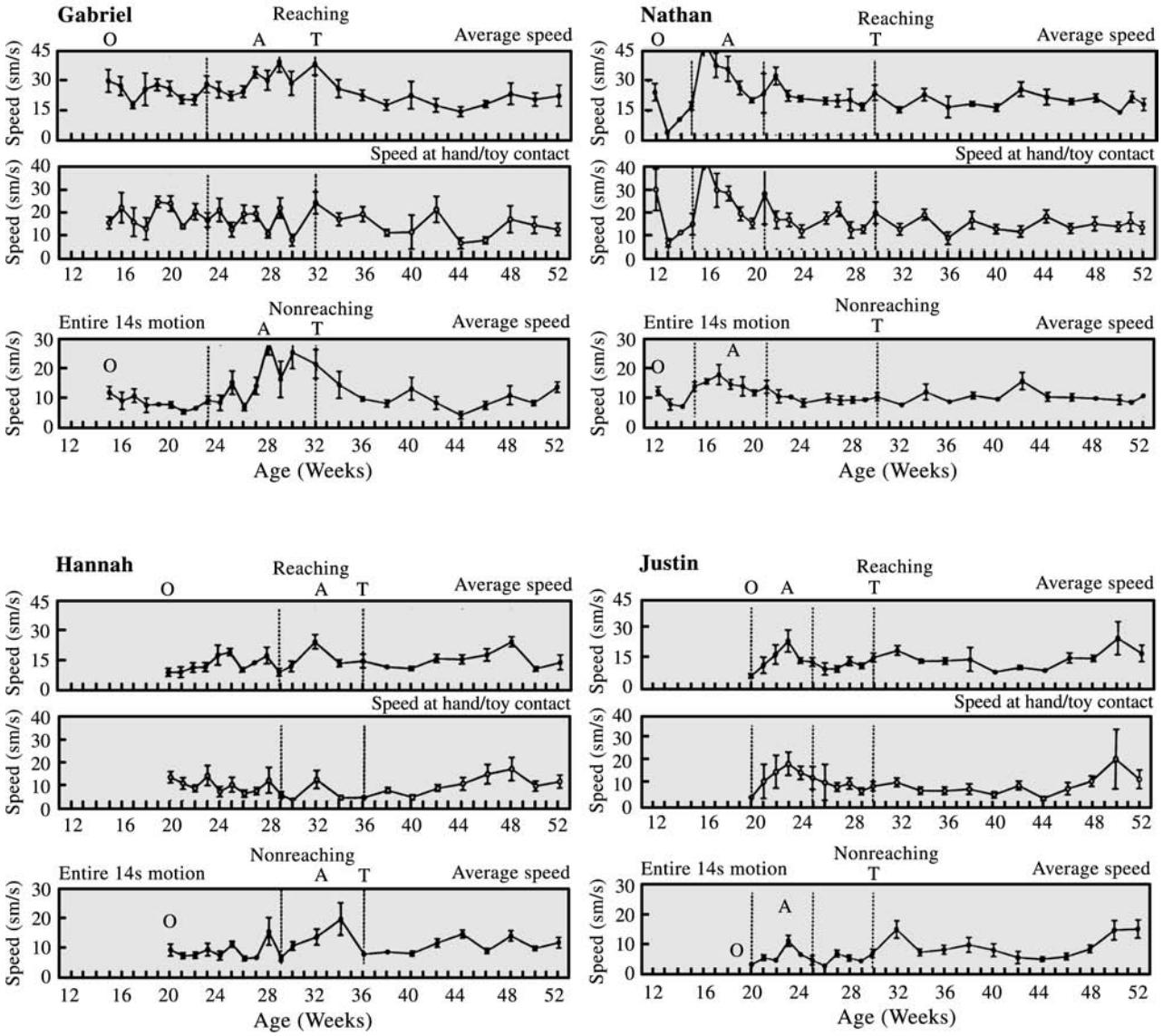


Figure 6.16 Average speed of reaching, speed at toy contact, and speed of nonreaching movements for the four infants in Figure 6.15. *Source:* From "The Development of Reaching during the First Year: The Role of Movement Speed," by E. Thelen, D. Corbetta, and J. Spencer, 1996, *Journal of Experimental Psychology: Human Perception and Performance, 22,* pp. 1059–1076. Copyright 1996 by the American Psychological Association. Reprinted with permissions.

These authors found that the preferred states of infants' motor systems in nonreaching movements—their individual intrinsic dynamics—profoundly influenced the nature of the transition to reaching. In particular, the four infants differed in the amplitude, and especially in the vigor, of their spontaneous arm movements in the months previous to reach onset. Two infants, Gabriel and Nathan, had large and vigorous movements; the other two were quieter and generated fewer and slower, less forceful movements. The task for all the babies was the same: To get their hands in the vicinities of the desired objects. But they had different problems to solve to do this: Gabriel and Nathan had to damp down their forceful movements to gain control; Hannah and Justin had to produce more muscle force to extend their arms forward in space and hold them stiffly against gravity. Examination of the actual torques used to move the arm segments showed

that Gabriel and Nathan were using their muscles primarily to counteract the passive inertial forces generated by the rapid movements of their arms, while Hannah and Justin were using their muscles to counteract gravity.

Many components are necessary for infants to begin to reach. They must be able to see the toy (or other target) and locate it in space. And they must want to get it. The visual and motivational aspects of reaching are probably not the control parameters because other evidence suggests that infants can locate objects in three-dimensional space rather well, if not perfectly, by age 3 months, and that they grasp and mouth objects and show interest in them. More likely, selecting the correct muscle patterns and scaling the activation appropriately allow infants to fashion their first reaches from their undirected movements.

Indeed, analysis of infants' muscle synergies from electromygraphic (EMG) recordings reveal that reaching onset was associated with changes in functional muscle use. Spencer and Thelen (1995), comparing EMG patterns in reaching and nonreaching movements before and after reach onset, discovered that when reaching infants frequently recruited their anterior deltoid muscle, alone and in combination with other muscles. (This shoulder muscle raises the upper arm.) Before reaching, infants sometimes also raised their arms, but they used other combinations of muscles to do this. The ability to selectively activate and control this muscle group was associated with goal-directed movements.

Thelen and colleagues speculated that infants learn specific functional muscle patterns through experience in moving during the weeks and months before reaching actually emerges. Infants' real-time activities of moving—sensing the "feel" of their limb dynamics and perceiving the consequences of their movements—are time-locked input to the degenerate and reentrant neural nets we described in an earlier section. As a consequence, categories of limb parameters emerge from all the possible combinations that are appropriate to the spatial location of the toy.

Changes in other system components may facilitate this discovery. For example, Thelen and colleagues found that infants did not reach until they could also stabilize their heads in a midline position. Possibly, strength and control of neck and head muscles are necessary before the arm can be lifted independently. Stable head and eyes also facilitates accurate localization of the to-be-reached object in space.

Shifts in Control during the First Year. Recall that in three infants, the collective variable dynamics had a striking nonlinear course over the first year (Figure 6.15), with a distinct period of seeming instability followed by a period of stability. Recall also that the individual infants had very different intrinsic movement dynamics, especially in relation to characteristic speeds. Studies of adult reaching have repeatedly shown that the speed of movements—reflecting the amount of energy delivered to the limbs—is a critical parameter in many aspects of motor control. Faster movements are generally less accurate, probably because there is less time to make fine adjustments (Fitts, 1954). Reach trajectories may require different strategies of control and different patterns of muscle activation, depending on whether they are performed slowly or rapidly (Flanders & Herrmann, 1992; Gottlieb, Corcos, & Agarwal, 1989). Similarly, very fast movements produce much greater motion-related passive forces than slow ones do, and thus pose different problems for neural control (Latash & Gottlieb, 1991; Schneider, Zernicke, Schmidt, & Hart, 1989). Could movement speed be acting as a control parameter in these developmental shifts?

Figure 6.16 illustrates the four infants' characteristic speed of movements over their first year. Plots show average and peak speed of the reach itself, as well as speed at the start and termination of the movement. In addition, Thelen et al. (1996) reported infants' speed of *nonreaching* movements, that is, all the movements infants produced during the 14-second sampling trials when they were not reaching. This analysis revealed several remarkable results. First, infants converged on more or less similar *good* movement and contact speed; it was not functional to grab the toy either too slowly or too rapidly. Second, within this common speed solution, individual speed *personalities* or intrinsic dynamics remained, on average. For example, Gabriel was a faster mover than Hannah. Third, there was close correspondence between characteristic movement speed in reaching and in nonreaching movements. The reaches were not isolated from the ongoing preferences and habits of the babies, but were molded from those dynamics. Finally, periods of faster movements were associated with instability in the collective variables, indicating poor control.

Although the factors that led the infants to move more quickly or more slowly are as yet unknown, this overall speed variable clearly acts as a control parameter on the straightness and smoothness of the reach trajectory. Again, individual acts of reaching are fashioned

at the moment and carry with them the state of the system at that moment, which, in turn, is determined by the system's history.

Bimanual Coordination

This interplay between task and intrinsic dynamics is equally well illustrated by another aspect of infants' reaching: Whether they reach with one or two hands. Gesell (1939; Gesell & Ames, 1947) first noted that the bilateral symmetry and preference of infants was very unstable and frequently shifted from unimanual limb use to bimanual, and from strongly lateralized preference to symmetry. The four infants in the Thelen et al. (1996) study amply demonstrated these shifts. Figure 6.17 (Corbetta & Thelen, 1996) shows individual frequencies of one- or two-handed reaching. Note that, in this situation, toys could always be grasped by one hand, so two-handed reaching was not obligatory for function. Not only did individual infants have mixed preferences, but no two infants were alike in their developmental course.

As in the single-arm trajectory, Corbetta and Thelen (1996) discovered that bimanual coordination was also influenced by infants' intrinsic dynamics—in this case, whether their limbs moved in a coupled fashion in nonreaching movements as well. When infants reached with two hands, the two arms tended to speed up and slow down together in all movements; limbs were symmetrically coupled. In contrast, no such coupling was noted at times when infants preferred to use only one hand to grab the toy. Furthermore, epochs of bimanual symmetry in reaching and nonreaching were associated with *periods of higher speed movements.* Gabriel, for instance, used two hands and had coupled movements almost throughout the year, and he was the most energetic baby. Hannah, in contrast, was largely unimanual and uncoupled (and moved slowly), except for the period in the middle of the year when her movement speed increased and her movement symmetry did as well. Movement speed was a control parameter for both the efficiency of the movement and the strength of bilateral coupling.

Although the infants had an obvious task goal in reaching out to grab a toy, this dynamic act emerged from a background of ongoing movement. The state of the infants' systems was emergent from their body architecture, metabolism, and motivation, and from how they had been moving in the months before. In such a view, no one part of the system is privileged—there is no dedicated reaching code in the brain. Reaching is a pattern that self-organizes from multiple components over several timescales: The here-and-now dynamics of the task and goal, and the longer-term dynamics of the infants' history of moving and reaching.

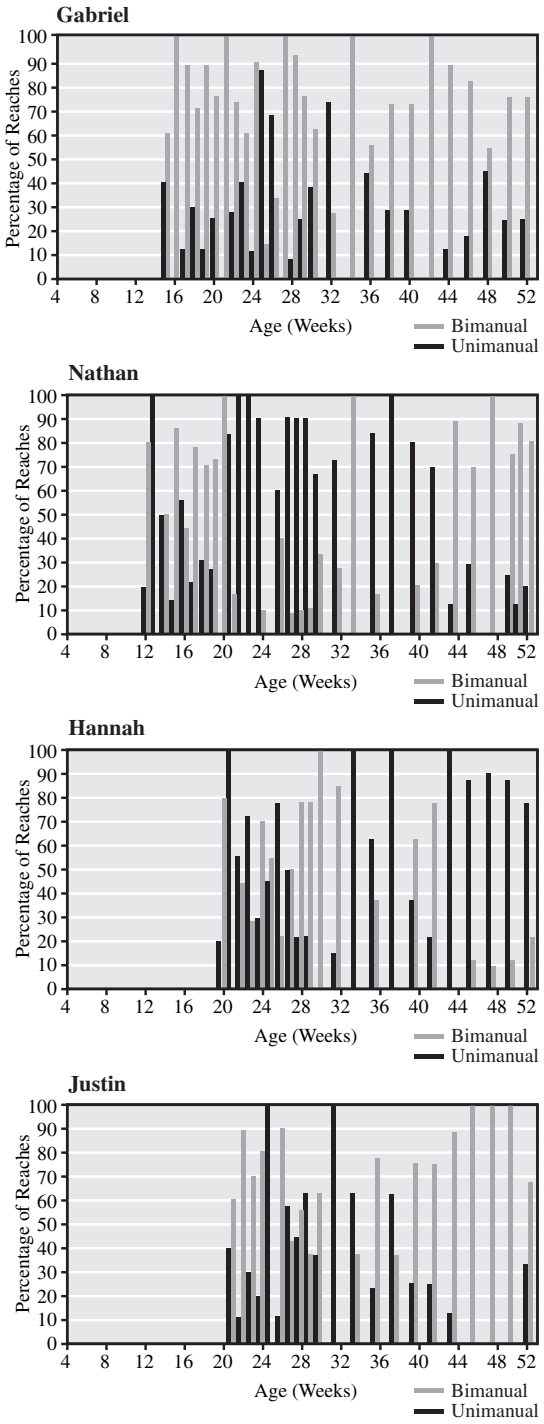


Figure 6.17 Percentages of uni- and bimanual reaches for the four infants in Figure 6.15.

A Model of Levels of Control

A dynamic view of the development of reaching revealed stagelike changes in the collective variables at the same time that reaching was embedded in the infants' continuous and ongoing intrinsic dynamics. In this section, we present a dynamic model of emergent control that reconciles these multiple levels and multiple timescales by proposing that they are dynamically *coupled.*

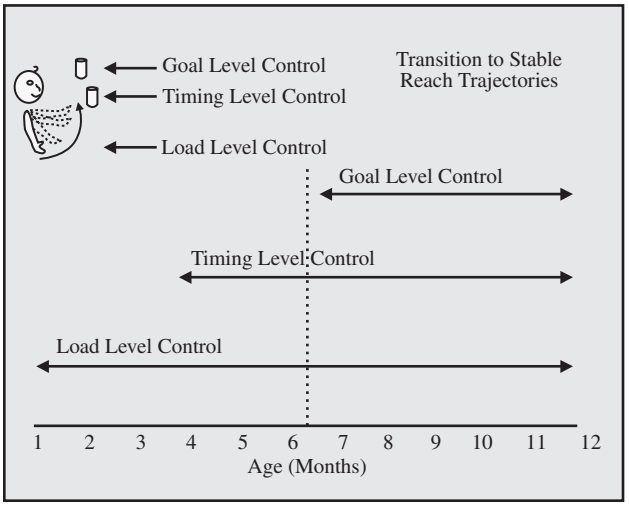

Goal Level Control
Timing Level Control
Load Level Control
Transition to Stable Reach Trajectories
Goal Level Control
Timing Level Control
Load Level Control
1 2 3 4 5 6 7 8 9 10 11 12
Age (Months)

Figure 6.18 A simple model of increasing control over reaching. After Schöner (1994), we have defined control as protecting that level from perturbations from the other levels. The load level involves the internal and external forces acting on the limbs and the associated stretch reflexes. The timing level involves the generation of a trajectory and the timing of the joints and muscles to execute the trajectory. The goal level is the spatial target. Infants only gradually gain control of these levels.

What Is Skill?

It is useful here to digress briefly and ask: What is involved in controlling the arm (or any body part) for successful and adaptive movement?

According to Bernstein (Bernstein, 1996), one of the hallmarks of skilled activity is the ability to flexibly adapt movements to current and future conditions. What constitutes skilled performance is not just a repeatable and stable pattern, but the ability to accomplish some high-level goal with rapid and graceful, but flexible solutions that can be recruited online or in anticipation of future circumstances. Consider, for example, a skilled equestrian whose goal is to stay on the horse and maintain a graceful posture, while leading the horse through an intended course. Skill in this case means making minute, online adjustments in response to the horse's movements while anticipating changes in the terrain.

Indeed, in movement, as well as in cognitive or social activities, we can define skill as being able to rapidly recruit appropriate strategies that meet the changing demands of the social, task, or physical environment. For reaching, good control means being able to efficiently reach in all directions, for moving or stationary objects, when the light is bright or dim, from any posture, while our attention is focused or distracted, and so on. On further analysis, we can identify the sources of potential disruption as affecting one of three levels of control of the reach. As depicted in Figure 6.18, reaching must be stabilized first against transient mechanical perturbations—various forms of external forces acting on the moving limb in a way that would tend to push the intended trajectory off course. (We know that adults are very good at maintaining their movement trajectory in the face of little bumps against the limb; e.g., Hogan, Bizzi, Mussa-Ivaldi, & Flash, 1987.) Second, reaching must be stabilized in the face of different task demands of the timing of the movement, such as setting the coordination pattern of the various joints and muscles, and producing the time-space trajectory of the arm. Finally, reaches must be stabilized even when the global goal parameters change—when the target is unexpectedly displaced (adults make these kinds of adjustments quickly and smoothly; Jeannerod, 1988). Using Gregor Schöner's (1994) terminology, we can define these levels of control as the *load, timing,* and *goal* levels.

In ordinary adult skilled actions, these levels are not separable; that is, people perceive, think, and act as one unit in the physical world. Levels of control are revealed only through extraordinary experimental manipulations, for example, when experimenters tell participants to hold a limb position constant when they apply an external load, or to reach to a target that is suddenly displaced. Adults are able, intentionally, to isolate, protect, or control their activities at several behavioral levels. This means that, in skilled adults, the levels of control are not tightly coupled; the goal level is not a slave of the arm's biomechanics although the load level contributes to the movement. We must emphasize that these levels are strictly a function of the imposed task demands.

They do not exist anatomically or functionally in the absence of the tasks.

Development of Levels of Control

Infants, in contrast, do not start out with this ability to protect one aspect of the task against perturbations—that is, to control their actions against unanticipated (and even anticipated) bumps from the environment. Indeed, what we want to argue here is that the initial state is highly syncretic; infants' movements are initially tightly coupled to lower-level dynamics, and only through experience and organic changes does a fully protected higher-level goal dynamic emerge.

We can see very clear examples of this in early spontaneous movements of the arms and legs. As we have argued previously, when young infants inject sufficient energy into their limbs, the resulting patterns suggest the dynamics of coupled oscillators with a periodic forcing function. Such dynamics must be the collective result of simple neural patterns in combination with the springlike properties of the joints and muscles and the effects of gravity—the load-level dynamics.

In the first months of life, infants are largely the captives of these dynamics. They cannot control well, or at all, the positions of their limbs in space or the timing of the segments during movement. Thus, the first problem that infants have to solve is control of these load-level dynamics; they must begin to weaken the obligatory coupling between the load level and the higher levels of control.

By the time infants first reach and grasp, at age 3 or 4 months, they must have begun, through their repeated movements, to generate a trajectory in time and space to attain something they see. But their reaches are still not fully controllable independent of the load level dynamics. Infants often reach too fast or too slowly; they overshoot, or inject energy bursts in stops and starts, leading to the patterns of acceleration and deceleration so characteristic of early reaching. This model predicts that without good control of the arm, the reach trajectory would degrade when movements are fast. This happens because fast movements create inertial forces between the segments of the arm, which require precise control—something skilled movers have continually. And, indeed, this is what happened in the four infant reachers described earlier: When movement speed increased, reach trajectories became more jerky and less straight (Figure 6.16).

The dramatic transition to smoother and straighter reaching that we saw at around age 7 months is, we suggest, the system's discovery of a stable trajectory solution—that is, the isolation and protection of the time-space parameters of getting the felt hand to the seen toy. Thus, by this age, reaches were no longer buffeted by load-level dynamics. Infants could reach smoothly and in a relatively straight manner, and they could control the segments against their own inertial forces.

Although 8- to 12-month-old infants, under ordinary and everyday conditions, look like pretty good reachers, we can create conditions that reveal that they have not yet mastered the highest level of skill—the ability to protect the goal from the lower-level dynamics. In the following section, we report on studies where the goal level—the location and the nature of the object to be reached—was perturbed. These experiments revealed that, in this unstable period, infants were not flexible; they were held captive, so to speak, by the arm pathways they had previously produced. Their trajectory formation was good but not flexible; they were stuck in the habits of previous reaches. We focus on classic object retrieval experiments—Piaget's "A-not-B" error. A dynamic systems account challenges the traditional explanations that object retrieval tasks tap into enduring knowledge about objects. Rather, we suggest that infants show traces of obligatory coupling between the goal and timing levels of trajectory control.

The Task Dynamics of the A-Not-B Error

One of the primary tasks of infancy is to learn about the properties of objects to act on them, think about them, and, eventually, talk about them. Literally thousands of papers have been written about the nature of object representation: When and how babies come to understand the spatial and temporal permanence of objects. One signature task that has been used to measure infants' understanding of objects asks infants to retrieve a hidden object. Odd patterns of search errors and dramatic developmental changes characterize performance between the ages of 6 and 12 months. We briefly review here our dynamic systems account of one of these search errors, the classic Piagetian A-not-B error (Smith, Thelen, Titzer, & McLin, 1999; Spencer, Smith, & Thelen, 2001; Thelen, Schōner, Scheier, & Smith, 2001; Thelen & Smith, 1994).

The A-Not-B Error. We present an example of how we have used the dynamic concepts of multicausality and nested time to revisit a classic issue in developmental psychology. The question originally posed by Piaget

(1962) was "when do infants acquire the concept of object permanence?" He devised a simple object-hiding task, which has been adopted by several generations of researchers. The experimenter hides a tantalizing toy under a lid at location A and the infant reaches for the toy. This A-location trial is repeated several times. Then, there is the crucial switch trial: the experimenter hides the object at new location, B. At this point, 8- to 10-month-old infants make a curious error. If there is a short delay between hiding and reaching, they reach not to where they saw the object disappear, but back to A, where they found the object previously. This A-not-B error is especially interesting because it is tightly linked to a highly circumscribed developmental period: Infants older than 12 months of age search correctly on the crucial B trials. Why this dramatic shift?

Do 12-month-old infants know something that 10-month-old infants do not? Piaget suggested that only at 12 months of age do infants know that objects can exist independently of their own actions. Others have suggested that during that 2-month period, infants shift their representations of space, change the functioning of their prefrontal cortices, learn to inhibit responses, change their understanding of the task, or increase the strength of their representations (Acredolo, 1979; Bremner, 1985).

There is merit to all of these ideas, but none can explain the full pattern of experimental results (Smith, Thelen, Titzer, & McLin, 1999). This might be because these accounts seek an explanation in terms of a single cause when there is no single cause. We offer a formal theory, the dynamic field model (Thelen et al., 2001) to explain how the A-not-B error is the emergent product of multiple causes interacting over nested timescales. The account begins with an analysis of the looking, reaching, and memory events that comprise the task, as illustrated in Figure 6.19.

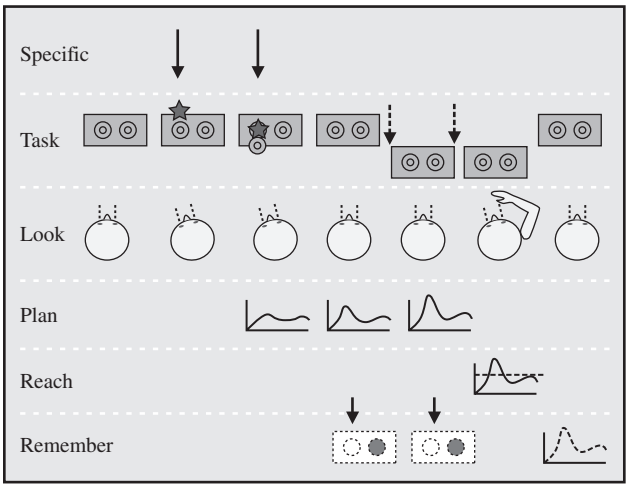


Figure 6.19 A task analysis of the A-not-B error, depicting a typical A-side hiding event. The box and hiding wells constitute the continually present visual input. The specific or transient input consists of the hiding of the toy in the A well. A delay is imposed between hiding and allowing the infant to search. During these events, the infant looks at the objects in view, remembers the cued location, and undertakes a planning process leading to the activation of reach parameters, followed by reaching itself. Finally, the infant remembers the parameters of the current reach.

Task Dynamics. The dynamic field simulates the decisions of infants to reach to location A or B by integrating, over time, the various influences on that decision. The field model is neurally inspired, of the type described and characterized analytically by Amari (1977), but it is abstract and not anatomically specific. The model has a one-dimensional activation field, defining a parameter space of potential activation states (in this case the locations of targets A and B). Inputs are represented by their location and their influence on the field. Most important, points in the field provide input to one another, which allows the field to become self-organizing. A highly activated point will exert a strong inhibitory influence over the points around it, allowing an activation to be maintained in the absence of external input.

Figure 6.20a illustrates the evolution of activation on the very first A trial. Before the infant has seen any object hidden, there is activation in the field at both the A and B locations from the two covers. As the experimenter directs attention to the A location by hiding the toy, it produces a high, transient activation at A. Then the field evolves a decision over time. When the activation peak crosses a threshold, the infant reaches to that location.

Most crucial for this account is that once infants reach, a memory of that reach becomes another input to the next trial. Thus, at the second A trial, there is some increased activation at site A because of the previous activity there. This combines with the hiding cue to produce a second reach to A. Over many trials to A, a strong memory of previous actions builds up. Each trial embeds the history of previous trials. Now, consider the crucial B trial in Figure 6.20b. The experimenter provides a strong cue to B. But as that cue

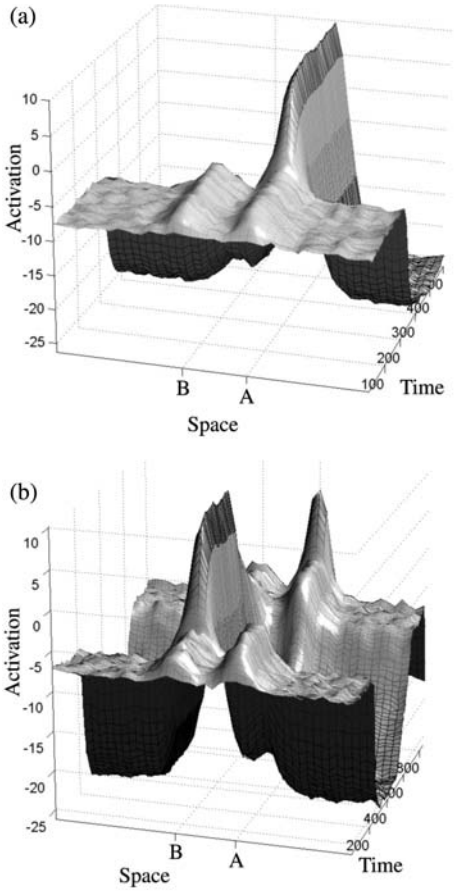


Figure 6.20 (a)The time evolution of activation in the planning field on the first A trial. The activation rises as the object is hidden and due to self-organizing properties in the field is sustained during the delay. (b) The time evolution of activation in the planning field on the first B trial. There is heightened activation at A prior to the hiding event due to memory for prior reaches. As the object is hidden at B, activation rises at B, but as this transient event ends, due to the memory properties of the field, this activation is pulled in the direction of the longer-term memories, toward A.

decays, the lingering memory of the actions at A begin to dominate the field, and, over time, to shift the decision back to the habitual A side. The model clearly predicts that the error is time dependent: There is a brief period immediately after the hiding event when infants should search correctly, and indeed they do (Wellman, Cross, & Bartsch, 1987).

Using this model as a guide, experimenters can make the error come and go. This is achieved by changing the delay, by heightening the attention-grabbing properties of the covers or the hiding event, and by increasing and decreasing the number of prior reaches to A (Diedrich, Thelen, & Smith, 2001; Smith et al., 1999). The error can occur (and not occur) even when there is no toy to be hidden (Smith et al., 1999). Directing attention to an in-view object A heightens activation at the location, and infants reach to that continually in-view object. Subsequently, when the experimenter directs attention to a different nearby in-view object B, infants watch, but then reach back to the original object A. Experimenters have also made the error vanish by making the reaches on the B trials different in some way from the A trial reaches. In the model, these differences decrease the influence of the A trial memories on the activations in the field.

One experiment achieved this by shifting the posture of the infant (Smith et al., 1999). An infant who sat during the A trials would then be stood up, as shown in Figure 6.21, to watch the hiding event at B, during the delay and during the search. This posture shift causes even 8- and 10-month-old infants to search correctly, just like 12-month-olds. In another experiment, the similarity of reaches on A and B trials was changed by putting on and taking off wrist weights (Diedrich, Smith, & Thelen, 2004). Infants who reached with "heavy" arms on A trials but "light" ones on B trials (and vice versa) did not make the error, again performing as if they were 2 to 3 months older. These results suggest that the relevant memories are in the language of the body and close to the sensory surface. In addition, they underscore the highly decentralized nature of error: The relevant causes include the covers on the table, the hiding event, the delay, the past activity of the infant, and the feel of the body of the infant.

This multicausality demands a rethinking of what is meant by knowledge and development. Do 10-month-old infants know something different when they make the error compared with when they do not? The answer is yes if we conceptualize knowledge and knowing as emergent or made at a precise moment from multiple components in relation to the task and to the immediately preceding activity of the system. What do 12-month-olds know that 10-month-olds do not? There can be no single cause, no single mechanism, and no one knowledge structure that distinguishes 10-month-olds from 12-month-olds because there are many causes that make the error appear and disappear. Instead, both 10- and 12-month-olds can be regarded as complex systems that self-organize during the task. However, just as trial dynamics are nested in task dynamics, so are task dynamics nested in developmental dynamics.

Figure 6.21 An infant sitting for an A trial and standing for a B trial.

Developmental Dynamics. The A-not-B error has been important to developmental theory because it is tightly linked to a few months in infancy. However, the neural field model suggests that the dynamics that create the error in infants are basic processes involved in goal-directed actions at all ages. Indeed, by changing the task, researchers can make preservative errors come and go in older children and adults, just as in infants.

Recently, Spencer and colleagues (2001) invented an A-not-B task that was suitable for 2-year-olds by hiding toys in a sandbox. The surface of the sand presents a uniform field, so there are no markers to indicate the two possible hiding locations. Experimenters gave toddlers many trials at location A, and then hid the toy at location B. With a delay of 10 s, the toddlers, having watched the toy being hidden at location B, still returned to location A to dig in the sand for the toy. Indeed, there are many other situations in which both children and adults fall back on a habit despite new information (Butler, Berthier, & Clifton, 2002; Hood, Carey, & Prasada, 2000). Nonetheless, in the standard A-not-B task, infants change their behavior over 2 months. In the field model, this is simulated by increasing the resting activation of the field. This makes it easier for the input from the hiding cue to form a self-sustaining peak at B to compete with the A memory. Similarly, in her model of the error (also a dynamics systems model), Munakata (1998) simulates development by stronger self-sustaining memories for the hiding event.

If self-sustaining memories drive the successes of older children, then we must ask where they come from. What are infants doing every day that improves their location memory? One possibility is their self-locomotion. Crawling appears to improve the spatial memories of infants (Bertenthal & Campos, 1990). But there are also other possibilities. Their fine motor control improves markedly during the last part of an infant's first year. Perhaps more experience perceiving objects and manipulating them improves the flexibility of infants to notice differences in the targets or to be less tied to their previous actions. Simply practicing the A-not-B task repeatedly improves performance (Diamond, 1990a). In this way, real-time activity in the task is unified with developmental time. Developmental change evolves from the real-time activities of the infant.

Implications of a Dynamic Approach. A dynamic systems theory of development helps to resolve an apparent theoretical contradiction. At a very global level, the constraints imposed by our biological heritage and by the similarities in human environments seem to result in similar developmental outcomes. All intact human infants learn to walk, progress from making the A-not-B

error to not making it, speak their native language, and form intense social relationships. But when one looks at the details of development, the picture seems far less deterministic. Children from the same family grow up to be amazingly different from one another. Children with social and economic advantages sometimes fail in life, whereas those from impoverished backgrounds succeed. Such nonlinearities might be reflected in development as stagelike shifts and might underlie the dramatic differences between 10- and 12-month-olds in the standard A-not-B task. But if development is made from real-time events, then these nonlinearities might also create individual differences. Even very small differences in beginning states and in developmental histories can amplify and lead to large individual differences. If this is so, then at the microlevel, development will be messier and very much tied to the idiosyncratic real-time activities of the infant. From a dynamic perspective, it is important to understand the processes by which the everyday activities of children create developmental change—both the universal attainments and the individual pathways.

What Is Knowing? What does all this mean for Piaget's original conclusions from watching his own children search for objects in the "wrong places"? What does all this mean for the results of Baillargeon and Graber (1988) and others who have found that infants seem to know that objects stay where they are put, in tasks in which they only watch but do not act? How does this dynamic systems account fit with Munakata, McClelland, Johnson, and Siegler (1997) and their connectionist account, in which internal representations of objects reside in one set of layers that deliver input to a separate system that acts?

One possible answer to these questions is that the A-not-B error is simply about reaching—not about the object and not about *knowing*. According to this answer, infants in the A-not-B task represent objects *independently from their actions* right from the beginning, although those representations may not, as Munakata et al. (1997) suggest, be strong enough to support goal-directed manual action. This answer divorces knowing from acting; the infant knows where the object is when it is hidden in B, but just cannot control the reach.

We believe this answer is wrong. Knowing is the process of dynamic assembly across multileveled systems in the service of a task. We do not need to invoke represented constructs such as "object" or "extended in space and time" outside the moment of knowing. Knowing, just like action, is the momentary *product* of a dynamic system, not a dissociable cause of action. Churchland (1986) put it this way:

> [B]rains are not in the business of pattern recognition for its own sake, and the nature of pattern recognition, as accomplished by brains, must be understood in the context of its role in how brains achieve motor control. Evolution being what it is, pattern recognition is there to subserve motor coordination. . . . [I]f we ignore motor control as the context within which we understand pattern recognition, we run the risk of generating biologically irrelevant solutions. (pp. 473–474)

We think to act. Thus, knowing may begin as and always be an inherently sensorimotor act. Our dynamic systems account thus stands on common ground with Piaget in the origins of thought in sensorimotor activity but also on common ground with Johnson (1987); Varela, Thompson, and Rosch (1991); Churchland (1986); and Edelman (1987) in the newer ideas of Barsalou (2005) and Glenberg and Kaschak (2002) that cognition emerges in the recurrent sensorimotor patterns that enable action to be perceptually guided.

Dynamic Systems and Other Theories of Development. How different is dynamical systems as a theory of development from other approaches? Thelen and Bates (2003) recently considered this question and their conclusions are summarized in Table 6.2. They specifically considered the following theoretical frameworks:

1. Chomsky's (1968, 1975, 1988) nativist theory of language development (which has inspired nativist theories in other domains as well—for a discussion, see Fodor, 1983)
2. E. J. Gibson's (1969) theory of perception and perceptual development (which is empiricist in emphasis)
3. Vygotsky's (1978) theory of cognitive development in a social framework (a theory that is strongly empiricist in flavor, though it is certainly a complex and interesting example of an empiricist approach)
4. Piaget's (1952, 1970) constructivist theory of cognitive development (a direct predecessor to today's emergentist approach)
5. Connectionism as laid out in Elman et al. (1996)
6. Dynamic systems as laid out in Thelen and Smith (1994)

TABLE 6.2 A Taxonomy of Developmental Theories

Theory	Chomsky	Gibson	Vygotsky	Piaget	Thelen/Smith	Elman/Bates
Emphasized mechanism of change	Maturation	Perceptual learning	Internalization	Consruction	Self-organization	Emergence/learned connections
Experience	No	Yes	Yes	Yes	Yes	Yes
External information	No	Yes	Yes	Yes	Yes	Yes
Social	No	No	Yes	No	No	No
Biological constraints	Yes	Yes	No	Yes	Yes	Yes
Brain development	No	No	No	No	Yes	Yes
Embodiment	No	Yes	No	Yes	Yes	No
Mental representations	Yes	No	Yes	Yes	No (not in traditional sense)	Yes
Dynamical systems	No	No (yes)	No	No	Yes	Yes
Formal models/simulations	Yes	No	No	No	Yes	Yes

Adapted from "Connectionism and Dynamic Systems: Are They Really Different?" by E. Thelen and E. Bates, 2003, *Developmental Science, 6,* pp. 378–391.

These six theories were compared with regard to (1) the primary mechanism of change, (2) the structuring role of external information, (3) the importance of social interaction, (4) the role of biological constraints, (5) the use of information about brain development as a theoretical constraint, (6) emphasis on sensorimotor processes, (7) emphasis on and elaboration of mental representations, (8) invocation of dynamic systems as a source of causation/explanation of structure and change, (9) use of mathematical formalisms, and (10) use of computer simulations as a tool for the study of development.

Mechanisms of Change. Chomsky invoked two related mechanisms to account for developmental change and the role of the environment: parameter setting and triggering. *Triggering* refers to the release of a preexisting behavioral option by an environmental event (not unlike the triggering of the processes that lead to male genitalia in the embryo by the genetically timed release of testosterone). *Parameter setting* is an enriched form of triggering, a process whereby children use environmental signals to select the correct parameters for their native language from an array of innate grammatical options. In elaborating these ideas over the years, Chomsky has consistently stressed that learning is highly overrated as a source of change, at least for those domains of behavior that are especially important for the species. For Gibson, the primary mechanisms of change are children's exploration of their environment and the discovery of matches between their current abilities and the affordances for action inherent in a richly structured environment. This is primarily a process of *perceptual learning,* or an increasing ability to discern relevant features in the perceptual array and thus to tune actions appropriately to them. Vygotsky built his theory on *internalization.* For Vygotsky, many of the cognitive and linguistic structures that make us human are first played out in the realm of behavioral interaction with a competent adult. By participating in social interaction, the young organism moves from incompetence to competence, internalizing the relevant structures until he or she can finally produce them on his or her own. Although this is a richer and more sophisticated form of environmental determination than one finds in many writings by many of Vygotsky's behaviorist contemporaries (American, European, and Russian), internalization is certainly a mechanism that is "pushed" from the outside. Piaget's seminal contribution was his consistent emphasis on the bidirectional nature of cognitive development, whereby children act on the world (assimilation) and then adjust their action schemata in accordance with their degree of success or failure (accommodation). The mechanism of change in connectionist accounts of development are principally changes in connection weights among subsymbolic neuron-like nodes such that the regularities in the world are incorporated *into* the internal processes that connect nodes to each other, and input to output. Some models begin with few constraining assumptions about architecture, whereas other's base their architecture on current understanding of neural pathways or as a

consequence of experience (see O'Reilly & Munakata, 2000, for a comprehensive review and tutorial). In all, however, the principal mechanism of change is incorporation of statistical regularities in the learning environment.

How does dynamic systems differ with regard to the principle causes of change? The concepts of self-organization and emergence proposed in dynamic systems theory bear a strong historical relationship to Piaget's constructivism, the emphasis on sensorimotor processes is shared with Gibsonian approaches, and a structuring role for the environment with connectionism. Contemporary dynamic systems approaches have not considered social interactions, but could in principle (see Yu & Ballard, 2004). Chomsky (and nativism) seems to be left out, but is he really? There are explicit formal theories of change in dynamic systems consistent with a triggering mechanism of change. Specifically, Yamauchi and Beer (1994) showed how the dynamics of continuous time recurrent networks can generate highly distinct patterns of sequential behavior, shifting between different attractor states, in response to an external trigger. That is, Chomsky's general idea of triggers and parameter settings could well be realized in a dynamic systems framework as a mechanism of change.

The Structuring Role of External Information. This dimension is strongly correlated with the mechanisms of change just described, although it is not quite the same thing. Nativist theories tend to downplay the structuring role of external information, while empiricist theories tend (by definition) to view the environment as a primary source of structure. Thus for Chomsky, the environment plays a limited role and acts primarily through triggering. Indeed, Chomsky has continually emphasized the paucity of the environment. For Vygotsky, in contrast, the social environment is a critical source of structure, internalized by the child through social interaction. Likewise, for Gibson, the child does not need to build complex mental structures to represent the environment because the environment is already rich in information, waiting only to be discovered. In this regard, Piaget continually emphasized the structured nature of the world in which the child exercises his or her minimal innate sensorimotor schemata, using information about a mismatch between his or her intentions and realization (disequilibrium) to motivate change. However, the endpoint of cognitive development (formal operations) reflects a long series of transformations and reorganizations, resulting in structures that cannot be detected directly in the outside world. External information is critical to connectionism because the incorporation of statistical regularities in the world is the principal mechanisms of change in those theories. External structure is critical to dynamic systems theories because the world, the specific task at hand, and a history of interaction in that world, is one of many causes organizing the system. However, in dynamic systems, a change in external structure may result in a completely different endpoint, but the endpoint itself is not contained in the environment. This then is a shared point with nativism: However, whereas nativism sees the main cause as the constraining properties of the system itself; dynamic systems sees the history of a complex system of many interacting internal and external components.

Importance of Social Interaction. Of the six theories summarized in Table 6.2, Vygotsky's theory is the only one that has taken social interaction seriously as a source of structure in cognitive development. Chomsky denies that social factors play any important structural role in language development, and Gibson does not assign any privileged status to social factors. Piaget acknowledged the importance of social factors in the construction of the mind (particularly in his works on language and culture—see Piaget's remarks on Vygotsky's views in Piaget, 1986), but did not study social processes. Thelen and Bates acknowledge that, to date, dynamic systems have failed to recognize social factors as a source of structure in developmental process.

The Role of Biological Constraints. Of the six theories compared in Table 6.2, Vygotsky's is the only one that had little or nothing to say about the role of biological constraints on development. Thelen and Bates suggest that this may be more a result of the issues of main interest to Vygotsky than a principled denial of the role of biology. All contemporary serious developmental theories acknowledged the role of biology. Theories differ from to stronger (nativist) to weaker (most connectionist) in the role of biology in determining specific outcomes. Dynamic systems in its multicausal, multilayered, *historical* approach sees biology and environment as continually meshed and inseparable. It makes no sense to ask which is most important or most determining.

Brain Development as a Source of Constraints. Thelen and Bates note that none of the four classic

theorists—Piaget, Gibson, Vygotsky, Chomsky—made much use of information from developmental neurobiology. But to be fair, there was far less useful information available in the first 50 to 60 years of the twentieth century. In the last 20 to 30 years, there has been an explosion of information about plasticity, activity-dependent factors in brain development, and the bidirectional roles of both genes and environment in brain development (see especially Chapter 5 of Elman et al., 1996; Chapter 5 of Thelen & Smith, 1994). Much of this information is incompatible with strong nativist theories (which emphasize a rigid form of biological determinism), and highly compatible with the kind of dynamic approach to development that we espouse. Still, the serious incorporation of advancing knowledge about neural development into general developmental theories has not yet happened. This is an important limitation on dynamical systems as yet developed.

Sensorimotor Bases of Higher Cognition. Piaget's emphasis on the sensorimotor bases of higher cognition is the linchpin of his theory, and may be viewed as his most creative and important contribution. The same point is explicitly disavowed by Chomsky (who is committed to a grammar that is autonomous from the rest of mind, much less the body itself). It is implicit in Gibson's theory, but for Thelen and Bates, not because of Gibson's strong critique of mentalism (see following), the idea was never fully developed. Vygotsky also gave these factors little role once language learning and socialization came into play. Current connectionist theories like most cognitivist theories give little attention to the role of the sensory-motor system. Dynamic systems theory, with its emphasis on perceptual-motor development, stands strongly in the tradition of Piaget in espousing the fully embodied mind.

Mental Representations. In their discussion, Thelen and Bates give representation to all theoretical perspectives but Gibson, noting that while some dynamic systems theorists eschew representation (Smith et al., 1999; Thelen & Smith, 1994), others embrace it (Spencer & Schoner, 2003). However, what one concludes depends on what one takes representation to mean. In the strong traditional sense, representation means Newell, Shaw, and Simon's (1957) physical symbol system: internally represented propositions that operate as symbols (with a syntax and a semantics) *within* a computational system. This is representation in the sense of Chomsky, Piaget, and Vygotsky among others. Then, there is representation-like: Any internal event in the system with some stability (or recurrence) that the *theorist* can point to as corresponding to some regularity in behavior. This is "representation" in the sense of connectionism and Thelen and Bates. Under this definition, it is hard to imagine a theory that does not have representations (because any internal regularity that corresponds to a behavioral regularity counts).

Dynamics as a Source of Structure and Change. Developmental theory should be about time: how real time events literally make (create) change. Dynamic systems, as a theory of development, represents an effort to implement insights from dynamic systems theory in physics, mathematics, and biology to a theory about change over time. This is the very core of the enterprise. Because dynamic systems is itself a late twentieth century movement, it is not surprising that these ideas had little influence on the four classic developmental theories. However, modern-day Gibsonians like Turvey, Kelso, and Shaw (Kelso, 1995; Turvey, 1977; Turvey, Shaw, Reed, & Mace, 1981) have been pioneers in using dynamic systems to explain aspects of perceptual and motor functioning in adult humans. Similarly, connectionist models as nonlinear neural networks are nonlinear dynamical systems (see especially Elman et al., 1996, Chapter 4); they embody the principles and phenomena that define dynamic systems theory. Although not all practitioners of connectionism are aware of the extent to which this is the case, and not all connectionist models have much to say about the interplay of real-time activity and the slower dynamics of learning and developmental change, Thelen and Bates conclude that connectionism and dynamic systems share, at base, the very same ideas about the nonlinear dynamics of change, sensitivity to initial conditions, and the sudden catastrophic transformations (including U-shaped behaviors) that can take place after gradual increments along some quantitative parameter. However, the mathematics of dynamic systems provides a way of studying, describing, and explaining change in general, including as we noted earlier, trigger-like and parameter-setting processes such as those proposed by Chomsky.

Mathematical Formalisms and Simulations. Formally specified theories have played an important role in Chomsky's and J. J. Gibson's theories, parts of Pi-

aget's theory, connectionism, and dynamical systems. Formal mathematical theories will become increasingly important in developmental psychology. Theories, which are merely strings of words (often ill-defined ones at that), can lead to debates about "what is really meant" and to confusions about the predictions that do or do not follow from some claim. Mathematical specification of theoretical claims and predictions derived from simulations are clearly the future for developmental theories of all persuasions.

SUMMARY

The point of Thelen and Bates's exercise was to situate dynamic systems in the larger landscape of developmental theories. As should be evident, dynamic systems is a powerful framework in which many different ideas—from triggers to associative learning to embodiment to socialization—may be realized. Dynamic systems is not so much in opposition to these other perspectives but a new way of unifying the many threads that comprise developmental change. What dynamic systems *adds* to this current landscape is both an emphasis on understanding development as a complex system of nested dynamics, and a complex system of self-organizing interactions at many levels of analysis, including those between the brain and the body, and between the body and world.

CONCLUSION: WHY DYNAMICS?

The major contribution of a dynamic approach to development is the potential to bring theoretical coherence to a field that has been beset by dialectics: Nature versus nurture, learning versus maturation, continuity versus discontinuity, structure versus process, perceptual versus conceptual, symbolic versus presymbolic, and so on. The danger of such either-or thinking is not that good studies have not been done, or cannot be done, but that the point of the enterprise, understanding change, can be forgotten. Only the framework and language of dynamics can erase these dualities and shift the focus to *how* the developing system works.

The promise of dynamics is realized through the assumptions of coupling and continuity. Coupling means that all components of the developing system are continually linked and mutually interactive in the individual and between the individual and the environment. Continuity means that processes are seamless in time and cumulative; mental and physical activity are assembled in the moment and always as a function of the system's history. Actions done in this moment, in turn, set the stage for behavior in the next second, minute, week, and year. With this formulation, it makes no sense to ask what part of behavior comes from stages, mental structures, symbol systems, knowledge modules, or genes because these constructs do not exist in timeless, disconnected form. There is no time and no level when the system ceases to be dynamic.

Dynamics is the language of stability and change, and a dynamic approach frames developmental questions about when systems are stable or change, and what makes them change. The power of dynamics is that these issues can be posed at many levels and timescales. The system is dynamic all the way down and all the way up! We can ask meaningful developmental questions at the neural, physiological level, or individual or social behavior level. Because dynamics seeks to be construct free, there is a real potential for integrating levels of analysis. Likewise, we can probe the system as it changes over the time of a single event, an experimental session, more extended training, or what we consider the *developmental* timescale of weeks or months. That dynamics is a framework and a language rather than a specific theory of the development of *something*—language, peer relations, visual perception, adolescent adjustment, and so on—is both a strength and a weakness. The strength is the potential for viewing many traditionally separate domains as subsumed under the same dynamic processes. The weakness is equally apparent. A dynamic approach does little of the real work. It suggests a way of thinking, a strategy for collecting developmental data, and hopefully, some analysis and modeling techniques that have broad generality. (That's not too bad!) The approach is not a substitute for the hardest part of understanding development: Collecting good data and using both descriptive and experimental methods. There are grave pitfalls in collecting data without clear theoretical assumptions, but it is equally dangerous to spin theories, verbal or mathematical, without a constant dialogue with data. For example, thinking dynamically allowed us to reinterpret the A-not-B error and generate new predictions, but only trudging back to the laboratory gave substance to the theorizing. These experiments hold promise for new theoretical insights, and so forth.

REFERENCES

Acredolo, L. (1979). Laboratory versus home: The effect of the environment on the 9-month-old infant's choice of spatial reference system. *Developmental Psychology, 15,* 666–667.

Acredolo, L. (1990). Behavioral approaches to spatial cognition. In A. Diamond (Ed.), *The development and neural bases of higher cognitive functions* (pp. 596–612). New York: National Academy of Sciences.

Adolph, K. E., Vereijken, B., & Shrout, P. E. (2003). What changes in infant walking and why. *Child Development, 74*(2), 475–497.

Amari, S. (1977). Dynamics of pattern formation in lateral inhibition type neural fields. *Biological Cybernetics, 27,* 77–87.

Baillargeon, R., & Graber, M. (1988). Evidence of location memory in 8-month-old infants in a nonsearch AB task. *Developmental Psychology, 24,* 502–511.

Baillargeon, R., Spelke, E. S., & Wasserman, S. (1985). Object permanence in 5-month-old infants. *Cognition, 20,* 191–208.

Baldwin, D. (1991). Infants' contribution to the achievement of joint reference. *Child Development, 62,* 791–875.

Baldwin, D. (1993). Early referential understanding: Infants' ability to recognize referential acts for what they are. *Developmental Psychology, 29*(5), 832–843.

Ballard, D., Hayhoe, M., Pook, P., & Rao, R. (1997). Deictic codes for the embodiment of cognition. *Behavioral and Brain Sciences, 20,* 723–767.

Baltes, P. B. (1987). Theoretical propositions of life-span developmental psychology: On the dynamics between growth and decline. *Developmental Psychology, 23,* 611–626.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84,* 191–215.

Barsalou, L. W. (2005). Abstraction as a dynamic interpretation in perceptual symbol systems. In L. Gershkoff-Stowe & D. Rakison (Eds.), *Building object categories in developmental time*. Hillsdale, NJ: Erlbaum, 389–431.

Bernstein, N. A. (1996). *Dexterity and its development* (M. L. Latash & M. T. Turvey, Eds. & Trans.). Hillsdale, NJ: Erlbaum.

Bertenthal, B. I., & Campos, J. J. (1990). A systems approach to the organizing effects of self-produced locomotion during infancy. In C. Rovee-Collier & L. P. Lipsitt (Eds.), *Advances in infancy research* (Vol. 6, pp. 1–60). Norwood, NJ: Ablex.

Bowlby, J. (1969). *Attachment and loss: Vol. 1. Attachment.* New York: Basic Books.

Breazeal, C., Buchsbaum, D., Gray, J., Gatenby, D., & Blumberg, B. (2005). Learning from and about others: Towards using imitation to bootstrap the social understanding of others by robots. In L. Rocha & F. Almedia e Costa (Eds.), *Artificial Life, 11,* 1–32.

Bremner, J. G. (1985). Object tracking and search in infancy: A review of data and theoretical evaluation. *Developmental Review, 5,* 371–396.

Brent, S. B. (1978). Prigogine's model for self-organization in nonequilibrium systems: Its relevance for developmental psychology. *Human Development, 21,* 374–387.

Bronfenbrenner, U. (1979). *The ecology of human development.* Cambridge, MA: Harvard University Press.

Bryant, P. E., & Trabasso, T. R. (1971). Transitive inferences and memory in young children *Nature, 232,* 456–458.

Bushnell, E. (1994). A dual processing approach to cross-modal matching: Implications for development. In D. Lewkowicz & R. Lickliter (Eds.), *The development of intersensory perception* (pp. 19–38). Mahwah, NJ: Erlbaum.

Butler, S. C., Berthier, N., & Clifton, R. (2002). 2-year-olds' search strategies and visual tracking in a hidden displacement task. *Developmental Psychology, 38,* 581–590.

Chi, M. T. H., Slotta, J. D., & deLeeuw, N. (1994). From things to processes: A theory of conceptual change for learning science concepts. *Learning and Instruction, 4,* 27–41.

Chomsky, N. (1968). *Language and mind.* New York: Brace & World.

Chomsky, N. (1975). *Reflections on language.* New York: Pantheon Books.

Chomsky, N. (1988). *Language and problems of knowledge: The Managua lectures.* Cambridge, MA: MIT Press.

Churchland, P. (1986). *Neurophilosophy: Towards a unified science of the mind-brain.* Cambridge, MA: MIT Press.

Churchland, P. S., & Sejnowski, T. J. (1992). *The computation brain.* Cambridge, MA: MIT Press.

Cohen, L. B., & Oakes, L. M. (1993). How infants perceive a simple causal event. *Developmental Psychology, 29,* 421–444.

Cooke, J. (1988). The early embryo and the formation of body pattern. *American Scientist, 76,* 35–41.

Corbetta, D., & Thelen, E. (1996). The developmental origins of bimanual coordination: A dynamic perspective. *Journal of Experimental Psychology: Human Perception and Performance, 22,* 502–522.

Crick, F. (1994). *The astonishing hypothesis: The scientific search for the soul.* New York: Charles Scribner's Sons.

Damasio, A. R. (1994). *Descartes' error: Emotion, reason, and the human brain.* New York: Putnam.

De Weerth, C., & van Geert, P. (2002). A longitudinal study of basal cortisol in infants: Intra-individual variability, circadian rhythm, and developmental trends. *Infant Behavior and Development, 25,* 375–398.

Diamond, A. (1990a). Development and neural bases of AB and DR. In A. Diamond (Ed.), *The development and neural bases of higher cognitive functions* (pp. 267–317). New York: National Academy of Sciences.

Diamond, A. (1990b). Developmental time course in human infants and infant monkeys and the neural bases of inhibitory control in reaching. In A. Diamond (Ed.), *The development and neural bases of higher cognitive functions* (pp. 637–676). New York: National Academy of Sciences.

Diedrich, F. J., Smith, L. B., & Thelen, E. (2004). *Memories and decisions close to the sensory surface.* Manuscript in preparation.

Diedrich, F. J., Thelen, E., & Smith, L. B. (2001). The role of target distinctiveness in infant perseverative reaching. *Journal of Experimental Child Psychology, 78,* 263–290.

Dixon, R. A., & Lerner, R. M. (1988). A history of systems in developmental psychology. In M. H. Bornstein & M. E. Lamb (Eds.), *Developmental psychology: An advanced textbook* (2nd ed., pp. 3–50). Hillsdale, NJ: Erlbaum.

Edelman, G. M. (1987). *Neural Darwinism.* New York: Basic Books.

Edelman, G. M. (1988). *Topobiology: An introduction to molecular embryology.* New York: Basic Books.

Elman, J. L., Bates, E. A., Johnson, M. H., & Karmiloff-Smith, A. (1996). *Rethinking innateness: A connectionist perspective on development.* Cambridge, MA: MIT Press.

Fetters, L., & Todd, J. (1987). Quantitative assessment of infant reaching movements. *Journal of Motor Behavior, 19,* 147–166.

Fitts, P. M. (1954). The information capacity of the human motor system in controlling the amplitude of movement. *Journal of Experimental Psychology, 47,* 381–391.

Flanders, M., & Herrmann, U. (1992). Two components of muscle activation: Scaling with the speed of arm movement. *Journal of Neuropsychology, 67,* 931–943.

Fodor, J. A. (1983). *The modularity of mind.* Cambridge, MA: MIT Press.

Ford, D. H., & Lerner, R. M. (1992). *Developmental systems theory: An integrative approach.* Newbury Park, CA: Sage.

Freeman, W. J. (1987). Simulation of chaotic EEG patterns with a dynamic model of the olfactory system. *Biological Cybernetics, 56,* 139–150.

Freyd, J. (1983). The mental representation of movement when statis stimuli are viewed. *Perception and Psychophysics, 33,* 575–581.

Gelman, R. (1969). Conservation acquisition: A problem of learning to attend to relevant attributes. *Journal of Experimental Child Psychology, 7,* 167–187.

Gelman, R., & Gallistel, C. R. (1978). *The child's understanding of number.* Cambridge, MA: Harvard University Press.

Gershkoff-Stowe, L. (2001). The course of children's naming errors in early word learning. *Journal of Cognition and Development, 2*(2), 131–155.

Gershkoff-Stowe, L. (2002). Object naming, vocabulary growth, and the development of word retrieval abilities. *Journal of Memory and Language, 46*(4), 665–687.

Gershkoff-Stowe, L., & Smith, L. B. (1997). A curvilinear trend in naming errors as a function of early vocabulary growth. *Cognitive Psychology, 34,* 37–71.

Gesell, A. (1939). Reciprocal interweaving in neuromotor development. *Journal of Comparative Neurology, 70,* 161–180.

Gesell, A., & Ames, L. B. (1947). The development of handedness. *Journal of Genetic Psychology, 70,* 155–175.

Gibson, E. J. (1969). *Principles of perceptual learning and development.* New York: Academic.

Gibson, J. J. (1979). *The ecological approach to visual perception.* New York: Houghton Mifflin.

Gierer, A. (1981). Generation of biological patterns and form: Some physical, mathematical, and logical aspects. *Progress in Biophysics and Molecular Biology, 37,* 1–47.

Glenberg, A., & Kaschak, M. (2002). Grounding language in action. *Psychological Bulletin and Review, 93,* 558–565.

Gogate, L., Walker-Andrews, A. W., & Bahrick, L. (2001). The intersensory origins of word comprehension: An ecological-dynamic systems view. *Developmental Science, 4,* 31–37.

Goldberger, A. L., & Rigney, D. R. (1988). Sudden death is not chaos. In J. A. S. Kelso, A. J. Mandell, & M. F. Shlesigner (Eds.), *Dynamic patterns in complex systems* (pp. 248–264). Singapore: World Scientific.

Goldman-Rakic, P. S. (1987). Development of control circuitry and cognitive function. *Child Development, 58,* 601–622.

Goldstein, M. H., King, A. P., & West, M. J. (2003). Social interaction shapes babbling: Testing parallels between birdsong and speech. *Proceedings of the National Academy of Sciences, 100*(13), 8030–8035.

Goldstein, M. H., & West, M. J. (1999). Consistent responses of human mothers to prelinguistic infants: The effect of prelinguistic repertoire size. *Journal of Comparative Psychology, 13,* 52–58.

Goodwin, B. C., & Cohen, N. H. (1969). A phase-shift model for the spatial and temporal organization of developing systems. *Journal of Theoretical Biology, 25,* 49–107.

Gottlieb, G. (1992). *The genesis of novel behavior: Individual development and evolution.* New York: Oxford University Press.

Gottlieb, G. L., Corcos, D. M., & Agarwal, G. C. (1989). Strategies for the control of voluntary movements with on mechanical degree of freedom. *Behavioral and Brain Sciences, 12,* 189–250.

Grebogi, C., Ott, E., & Yorke, J. A. (1987). Chaos, strange attractors, and fractal basin boundaries in nonlinear dynamics. *Science, 238,* 632–638.

Haken, H. (1977). *Synergetics: An introduction.* Heidelberg:Springer-Verlag.

Halverson, H. M. (1931). Study of prehension in infants. *Genetic Psychological Monographs, 10,* 107–285.

Halverson, H. M. (1933). The acquisition of skill in infancy. *Journal of Genetic Psychology, 43,* 3–48.

Harrison, J. (2001). *Synaesthesia: The strangest thing.* New York: Oxford University Press.

Hock, H. S., Kelso, J. A. S., & Schōner, G. (1993). Bistability and hysteresis in organization of apparent motion pattern. *Journal of Experimental Psychology: Human Perception and Performance, 19,* 63–80.

Hood, B., Carey, S., & Prasada, S. (2000). Predicting the outcomes of physical events: 2-year-olds fail to reveal knowledge of solidity and support. *Child Development, 71,* 1540–1554.

Hogan, N., Bizzi, E., Mussa-Ivaldi, F. A., & Flash, T. (1987). Controlling multijoint motor behavior. In K. B. Pandolf (Ed.), *Exercise and sport science reviews* (Vol. 15, pp. 153–190). New York: Macmillan.

Hurford, J. (2003). The neural basis of predicate-argument structure. *Behavioral and Brain Sciences, 26*(3), 261–283.

Hutchins, E. (1995). *Cognition in the wild.* Cambridge, MA: MIT Press.

Huttenlocher, P. R. (2002). *Neural plasticity: The effects of environment on the development of the cerebral cortex.* Cambridge, MA: Harvard University Press.

Jeannerod, M. (1988). *The neural and behavioural organization of goal-directed movements.* Oxford, England: Clarendon Press.

Jenkins, W. M., Merzenich, M. M., & Recanzone, G. (1990). Neocortical representational dynamics in adult primates: Implications for neuropsychology. *Neuropsychological, 28,* 573–584.

Johnson, M. H. (1987). *The body in the mind: The bodily basis of meaning, imagination, and reason.* Chicago: University of Chicago Press.

Jones, S. S., & Smith, L. B. (1993). The place of perception in children's concepts. *Cognitive Development, 8,* 113–139.

Kaas, J. H. (1991). Plasticity of sensory and motor maps in adult mammals. *Annual Review of Neurosciences, 14,* 137–167.

Kelso, J. A. S. (1995). *Dynamic patterns: The self-organization of brain and behavior.* Cambridge, MA: MIT Press.

Kent, R. D. (1981). Articulatory-acoustic perspectives on speech development. In R. E. Stark (Ed.), *Language behavior and early childhood* (pp. 105–126). New York: Elsevier.

King, A., & West, M. (1988). Searching for the functional origins of cowbird song in eastern brown-headed cowbirds (*Molothrus ate rater*). *Animal Behavior, 36,* 1575–1588.

Kitchener, R. F. (1978). Epigenesis: The role of biological models in developmental psychology. *Human Development, 21,* 141–160.

Koch, C., & Davis, J. L. (Eds.). (1994). *Large-scale neuronal theories of the brain.* Cambridge, MA: MIT Press.

Kugler, P. N., & Turvey, M. T. (1987). *Information, natural law, and the self-assembly of rhythmic movement.* Hillsdale, NJ: Erlbaum.

Kuhn, D., & Phelps, E. (1982). The development of problem-solving strategies. In H. Reese & L. Lipsitt (Eds.), *Advances in child development and behavior* (Vol. 17, pp. 2–44). New York: Academic Press.

Kuo, Z.-Y. (1967). *The dynamics of behavior development: An epigenetic view.* New York: Random House.

Kuo, Z.-Y. (1970). The need for coordinated efforts in developmental studies. In L. R. Aronson, E. Tobach, D. S. Lehrman, & J. S. Rosenblatt (Eds.), *Development and evolution of behavior: Essays in memory of, T. C. Schnirla* (pp. 181–193). San Francisco: Freeman.

Lakoff, G., & Johnson, M. (1980). *Metaphors we live by.* Chicago: University of Chicago.

Landau, B., & Gleitman, L. (1985). *Language and experience.* Cambridge, MA: Harvard University Press.

Latash, M. L., & Gottlieb, G. L. (1991). Reconstruction of joint complaint characteristics during fast and slow movements. *Neuroscience, 43,* 697–712.

Lehrman, D. S. (1953). A critique of Konrad Lorenz's theory of instinctive behavior. *Quarterly Review of Biology, 28,* 337–363.

Lehrman, D. S. (1971). Behavioral science, engineering, and poetry. In E. Tobach, L. R. Aronson, & E. Shaw (Eds.), *The biopsychology of development* (pp. 459–471). New York: Academic Press.

Lewin, K. (1936). *Principles of topological psychology.* New York: McGraw-Hill.

Lewin, K. (1946a). Action research and minority problems. *Journal of Social Issues, 2,* 34–36.

Lewin, K. (1946b). Behavior and development as a function of the total situation. In L. Carmichael (Ed.), *Manual of child psychology* (pp. 791–844). New York: Wiley.

Lewis, M. D. (2000). Emotional self-organization at three time scales. In M. D. Lewis & I. Granic (Eds.), *Emotion, development, and self-organization* (pp. 37–69). Cambridge, UK: Cambridge University Press.

Lickliter, R. (1994). Prenatal visual experience alters postnatal sensory dominance hierarchy in bobwhite quail chicks. *Infant Behavior and Development, 17,* 185–193.

Lorenz, K. Z. (1965). *Evolution and modification of behavior.* Chicago: University of Chicago Press.

Marx, J. L. (1984a). New clues to developmental timing. *Science, 226,* 425–426.

Marx, J. L. (1984b). The riddle of development. *Science, 226,* 1406–1408.

Mathew, A., & Cook, M. (1990). The control of reaching movements by young infants. *Child Development, 61,* 1238–1258.

McGeer, T. (1990). Passive dynamic walking. *International Journal of Robotics Research, 9*(2), 62–82.

McGraw, M. G. (1932). From reflex to muscular control in the assumption of an erect posture and ambulation in the human infant. *Child Development, 3,* 291–297.

Meakin, P. (1986). A new model for biological pattern formation. *Journal of Theoretical Biology, 118,* 101–113.

Merzenich, M. M., Allard, T. T., & Jenkins, W. M. (1990). Neural ontogeny of higher brain function: Implications of some recent neuropsychological findings. In O. Franzn & P. Westman (Eds.), *Information processing in the somatosensory system* (pp. 293–311). London: Macmillan.

Mondloch, C. J., & Maurer, D. (2004). Do small white balls squeak? Pitch-object correspondences in young children. *Cognitive, Affective, and Behavioral Neuroscience: Special Multisensory Process, 4*(2), 133–136.

Muchisky, M., Gershkoff-Stowe, L., Cole, E., & Thelen, E. (1996). *The epigenetic landscape revisited: A dynamic interpretation—Advances in infancy research* (Vol. 10, pp. 121–159). Norwood, NJ: Ablex.

Munakata, Y. (1998). Infant perseveration and implications for object permanence theories: APDP model of the A-not-B task. *Developmental Science, 1,* 161–184.

Munakata, Y., McClelland, J. L., Johnson, M. H., & Siegler, R. S. (1997). Rethinking infant knowledge: Toward an adaptive process account of successes and failures in object permanence tasks. *Psychological Review, 104,* 686–713.

Murray, J. D. (1988). How the leopard gets it spots. *Scientific American, 258*(3), 80–87.

Murray, J. D. (1993). *Mathematical biology* (2nd ed.). Berlin, Germany: Springer-Verlag.

Neville, H. J., & Bavelier, D. (2002). Specificity and plasticity in neurocognitive development in humans. In M. H. Johnson & Y. Munakata (Eds.), *Brain development and cognition: A reader* (2nd ed., pp. 251–271). Malden, MA: Blackwell.

Newell, A., Shaw, J. C., & Simon, H. A. (1957). Empirical explorations of the logic theory machine. *Proceedings of the Western Joint Computer Conference,* pp. 218–239.

Oller, D. K. (2000). *The emergence of the speech capacity.* Mahwah, NJ: Erlbaum.

O'Regan, J. K., & Noë, A. (2001). A sensorimotor account of vision and visual consciousness. *Behavioral and Brain Sciences.*

O'Reilly, R. C., & Munakata, Y. (2000). *Computational Exploration in Cognitive Neuroscience,* Cambridge, MA: MIT Press.

Oyama, S. (1985). *The ontogeny of information: Developmental systems and evolution.* Cambridge, England: Cambridge University Press.

Pfeiffer, R., & Scheier, C. (1999). *Understanding Intelligence.* Cambridge, MA: MIT Press.

Piaget, J. (1952a). *The origins of intelligence in children.* New York: International Universities Press.

Piaget, J. (1952b). *Play, dreams and imitation in childhood.* New York: Norton.

Piaget, J. (1954). *The construction of reality in the child.* New York: Basic Books.

Piaget, J. (1970). *Genetic Epistemology.* New York: W.W. Norton & Company, Inc.

Piaget, J. (1986). Essay on necessity. *Human Development, 29,* 301–314.

Prigogine, I. (1978). Time, structure, and fluctuations. *Science, 201,* 777–785.

Prigogine, I., & Stengers, I. (1984). *Order out of chaos: Man's new dialogue with nature.* New York: Bantam Books.

Richardson, D., & Spivey, M. (2000). Representation, space, and Hollywood Squares: Looking at things that aren't there anymore. *Cognition, 76,* 269–295.

Richardson, D. C., Spivey, M. J., Barsalou, L. W., & McRae, K. (2003). Spatial representations activated during real-time comprehension of verbs. *Cognitive Science, 27,* 767–780.

Robertson, S. S. (1989). Mechanism and function of cyclicity in spontaneous movement. In W. P. Smotherman & S. R. Robinson (Eds.), *Behavior of the fetus* (pp. 77–94). Caldwell, NJ: Telford.

Rovee-Collier, C., & Hayne, H. (1987). Reactivation of infant memory: Implications for cognitive development. In H. Reese (Ed.), *Advances in child development and behavior* (Vol. 20, pp. 185–238). San Diego, CA: Academic Press.

Sameroff, A. J. (1983). Developmental systems: Contexts and evolution. In P. H. Mussen (Ed.), *Handbook of child psychology* (Vol. 1, pp. 237–294). New York: Wiley.

Sameroff, A. J., & Chandler, M. J. (1975). Reproductive risk and the continuum of caretaking casualty. In F. D. Horowitz, M. Hetherington, S. Scarr-Salapatek, & G. Siegel (Eds.), *Review of child development research* (Vol. 4, pp. 187–244). Chicago: University of Chicago Press.

Samuelson, S., & Smith, L. B. (2000). Grounding development in cognitive processes. *Child Development, 71,* 98–106.

Schaal, S. (1999). Is imitation learning the route to humanoid robots? *Trends in Cognitive Sciences, 3,* 233–242.

Schneider, K., Zernicke, R. F., Schmidt, R. A., & Hart, T. J. (1989). Changes in limb dynamics during the practice of rapid arm movements. *Journal of Biomechanics, 22,* 805–817.

Schneirla, T. C. (1957). The concept of development in comparative psychology. In D. B. Harris (Ed.), *The concept of development: An issue in the study of human behavior* (pp. 78–108). Minneapolis: University of Minnesota Press.

Scholz, J. P., Kelso, J. A. S., & Schōner, G. (1987). Nonequilibrium phase transitions in coordinated biological motion: Critical slowing down, and switching time. *Physics Letters, A123,* 390–394.

Schōner, G. (1994). Dynamic theory of action perception patterns: The time before contact paradigm. *Human Movement Science, 13,* 415–439.

Schōner, G., & Kelso, J. A. S. (1988). Dynamic pattern generation in behavioral and neural systems. *Science, 239,* 1513–1520.

Smith, L. B. (2005). *Using space to bind names to things.* Manuscript submitted for publication.

Smith, L. B., & Gasser, M. (2005). The development of embodied cognition: Six lessons from babies *Artificial Life* (Vol. 11, Issues 1–2, pp. 13–30).

Smith, L. B., & Thelen, E. (1993). *A dynamic systems approach to development: applications.* Cambridge, MA: MIT Press.

Smith, L. B., Thelen, E., Titzer, R., & McLin, D. (1999). Knowing in the context of acting: The task dynamics of the A not B error. *Psychological Review, 106,* 235–260.

Spelke, E. S., Breinlinger, K., Macomber, J., & Jacobson, K. (1992). Origins of knowledge. *Psychological Review, 99,* 605–632.

Spencer, J. P., & Schöner, G. (2003). Bridging the representational gap in the dynamic systems approach to development. *Developmental Science, 6,* 392–412.

Spencer, J. P., Smith, L. B., & Thelen, E. (2001). Tests of a dynamic systems account of the A-not-B error: The influence of prior experience on the spatial memory abilities of 2-year-olds. *Child Development, 72,* 1327–1346.

Spencer, J. P., & Thelen, E. (1995, November). *A new method for detecting muscle pattern changes in unconstrained, multi-joint learning tasks: II. Multi-muscle state activity.* Poster presented at the 25th annual meeting of the Society of Neuroscience, San Diego, CA.

Stein, B. E., & Meredith, M. A. (1993). *The merging of the senses.* Cambridge, MA: MIT Press.

Tapaswi, P. K., & Saha, A. K. (1986). Pattern formation and morphogenesis: A reaction-diffusion model. *Bulletin of Mathematical Biology, 48,* 213–228.

Thatcher, R. W. (1991). Maturation of the human frontal lobes: Physiological evidence for staging. *Developmental Neuropsychology, 7,* 397–419.

Thatcher, R. W. (1992). Cyclic cortical reorganization during early childhood. *Brain and Cognition, 20,* 24–50.

Thelen, E. (1989). Self-organization in developmental processes: Can systems approaches work. In M. Gunnar & E. Thelen (Eds.), *Minnesota Symposia on Child Psychology: Vol. 22. Systems and development* (pp. 77–117). Hillsdale, NJ: Erlbaum.

Thelen, E., & Bates, E. (2003). Connectionism and dynamic systems: Are they really different? *Developmental Science, 6,* 378–391.

Thelen, E., Corbetta, D., Kamm, K., Spencer, J. P., Schneider, K., & Zernicke, R. F. (1993). The transition to reaching: Mapping intention and intrinsic dynamics. *Child Development, 64,* 1058–1098.

Thelen, E., Corbetta, D., & Spencer, J. (1996). The development of reaching during the first year: The role of movement speed. *Journal of Experimental Psychology: Human Perception and Performance, 22,* 1059–1076.

Thelen, E., & Fisher, D. M. (1982). Newborn stepping: An explanation for a "disappearing reflex." *Developmental Psychology, 18,* 760–770.

Thelen, E., Fisher, D. M., & Ridley-Johnson, R. (1984). The relationship between physical growth and a newborn reflex. *Infant Behavior and Development, 7,* 479–493.

Thelen, E., Schōner, G., Scheier, C., & Smith, L. B. (2001). The dynamics of embodiment: A field theory of infant perseverative reaching. *Behavioural and Brain Sciences, 24,* 1–86.

Thelen, E., & Smith, L. B. (1994). *A dynamic systems approach to the development of cognition and action.* Cambridge, MA: Bradford Books/MIT Press.

Thelen, E., & Ulrich, B. D. (1991). Hidden skills: A dynamical systems analysis of treadmill stepping during the first year. *Monographs of the Society for Research in Child Development, 56*(No. 223).

Thom, R. (1983). *Mathematical models of morphogenesis.* New York: Wiley.

Thomas, M. S. C., & Karmiloff-Smith, A. (2003). Modeling language acquisition in atypical phenotypes. *Psychological Review, 110*(4), 647–682.

Titzer, R., Thelen, E., & Smith, L. B. (2003). *Learning about transparency.* Unpublished manuscript.

Tomasello, M., & Krueger, A. C. (1992). Joint attention on actions: Acquiring verbs in ostensive and non-ostensive contexts. *Journal of Child Language, 19,* 311–329.

Turkewitz, G. (1994). Sources of order for intersensory functioning. In D. J. Lewkowicz & R. Lickliter (Eds.), *The development of intersensory perception: Comparative perspectives.; the development of intersensory perception: Comparative perspectives* (pp. 3–17). Hillsdale, NJ: Erlbaum.

Turvey, M. (1977). Contrasting orientations to the theory of visual information processing. *Psychological Review, 84,* 67–88.

Turvey, M. T., Shaw, R. E., Reed, E. S., & Mace, W. (1981). Ecological laws of perceiving and acting: In reply to Fodor & Pylyshyn. *Cognition, 9,* 237–304.

van der Maas, H. L. J., & Molenaar, P. C. M. (1992). Stagewise cognitive development: An application of catastrophe theory. *Psychological Review, 99,* 395–417.

van Geert, P. (2000). The dynamics of general developmental mechanisms: From Piaget and Vygotsky to dynamic systems models. *Current Directions in Psychological Science, 9,* 64–68.

Varela, F., Thompson, E., & Rosch, E. (1991). *The embodied mind.* Cambridge, MA: MIT Press.

von Bertalanffy, L. (1933). *Modern theories of development.* London: Oxford University Press.

von Bertalanffy, L. (1968). *General system theory.* New York: Braziller.

von Hofsten, C. (1991). Structuring of early reaching movements: A longitudinal study. *Journal of Motor Behavior, 23,* 280–292.

Vygotsky, L. S. (1962). *Thought and language.* Cambridge, MA: MIT Press.

Vygotsky, L. (1978). *Mind in Society: The development of higher mental functions.* Cambridge, MA: Harvard University Press.

Waddington, C. H. (1954). The integration of gene-controlled processes and its bearing on evolution. *Proceedings of the 9th International Congress of Genetics, 9,* 232–245.

Waddington, C. H. (1957). *The strategy of the genes.* London: Allen & Unwin.

Waddington, C. H. (1977). *Tools for thought.* New York: Basic Books.

Wellman, H. M., Cross, D., & Bartsch, K. (1987). A meta-analysis of research on stage 4 object permanence: The A-not-B error. *Monographs of the Society for Research in Child Development, 5*(3, Serial No. 214).

West, M., & King, A. (1996). Eco-gen-actics: A systems approach to the ontogeny of avian communication. In D. E. Kroodsma & E. H. Miller (Eds.), *The evolution and ecology of acoustic communication in birds* (pp. 20–38). Ithaca, NY: Cornell University Press.

Wolff, P. H. (1987). *The development of behavioral states and the expression of emotions in early infancy: New proposals for investigation.* Chicago: University of Chicago Press.

Wolpert, L. (1971). Positional information and pattern formation. *Current Topics in Developmental Biology, 6,* 183–223.

Yates, K., & Pate, E. (1989). A cascading development model for amphian embryos. *Bulletin of Mathematical Biology, 31,* 549–578.

Yamauchi, B., & Beer, R. D. (1994). Sequential behavior and learning in evolved dynamical neural networks. *Adaptive Behavior, 2*(3), 219–246.

Yan, Z., & Fischer, K. (2002). Always under construction: Dynamic variations in adult cognitive microdevelopment. *Human Development, 45,* 141–160.

Yu, C., & Ballard, D. (2004). A multimodal learning interface for grounding spoken language in sensory perceptions. *ACM Transactions on Applied Perception, 1,* 57–80.

Zlatev, J., & Balkenius, C. (2001). Introduction: Why epigenetic robotics. In C. Balkenius, J. Zlatev, H. Kozima, K. Dautenhahn, & C. Breazeal (Eds.), *Proceedings of the First International Workshop on Epigenetic Robotics: Modeling cognitive development in robotic systems* (Vol. 85, pp. 1–4). Lund University Cognitive Studies.

CHAPTER 7

Dynamic Development of Action and Thought

KURT W. FISCHER and THOMAS R. BIDELL

DYNAMIC STRUCTURALISM 314
Variability in the Middle of Things: An Example of Representing Social Interactions 315
Dynamic Nature of Psychological Structure 317
Dynamic Structure in Living Systems 318
Variation and Order in Development: The Constructive Web 319
DYNAMIC STRUCTURE IN COGNITIVE AND EMOTIONAL DEVELOPMENT 320
Psychological Structure as Dynamic Skill 321
Building a Constructive Web for Positive and Negative Social Interactions 325
How Dynamic Skills Explain Variability in Development 329
THE CRISIS OF VARIABILITY AND THE CARTESIAN SYNTHESIS IN DEVELOPMENTAL SCIENCE 336
The Cartesian Dualist Framework 337
The Tacit Modern Synthesis in Psychology: Nativism and Empiricism Together 338
The Structure-as-Form Paradigm 340
The Stage Debate and the Discovery of Variability in Cognitive Development 341
Explaining Variability versus Explaining It Away 342
The Constructivist Alternative 346
METHODOLOGY OF DYNAMIC STRUCTURAL ANALYSIS 347
Starting in the Middle of Things: Implications for Design 348
Guidelines for Developmental Research 349
Building and Testing Models of Growth and Development 356
BUILDING STRUCTURES: TRANSITION MECHANISMS, MICRODEVELOPMENT, AND NEW KNOWLEDGE 363
Relations between Micro- and Macrodevelopment 363
Construction Processes: From Micro to Macro 364
EMOTIONS AND THE DYNAMIC ORGANIZATION OF ACTIVITY AND DEVELOPMENT 370
Emotion and Cognition Together 370
Organizing Effects of Emotions 372
Emotionally Organized Development 376
JOINING NATURE AND NURTURE: GROWTH CYCLES OF PSYCHOLOGICAL AND BRAIN ACTIVITY 382
Epigenesis of Action, Feeling, Thought, and Brain 382
Principles for Understanding Growth Patterns of Brain and Behavior 383
Cycles of Reorganization in Development 385
CONCLUSION: DYNAMICS OF STABILITY AND VARIABILITY IN DEVELOPMENT 388
REFERENCES 390

Human activity is both organized and variable, dynamically changing in principled ways. Children and adults are flexible and inventive in their action and thought, adapting old ideas to new situations and inventing concepts, formulating plans, and constructing hypotheses while participating in a wide variety of cultural practices. Few developmentalists today would disagree, as, for half a century, psychologists have been accumulating a wealth of evidence on the constructive, self-regulating, and culturally contextualized nature of human psychological processes. If *psychological function*—the way people act—is constructive, dynamic, and culturally embedded, then *psychological structure*—the organization or pattern of activities—is equally so. Yet remarkably, the most widely used conceptions of psychological structure and its development do not reflect this dynamic, constructive, and contextualized picture of psychological processes. The opposite is true: The major models of development describe psychological structure in static, formal terms. Concepts like universal stages, innate linguistic modules, and innate cognitive competencies portray psychological

Preparation of this chapter was supported by grants from Ms. and Mrs. Frederick P. Rose and the Harvard Graduate School of Education.

organization as fixed and unchanging, insulated from variation in context and feedback from activity.

The hallmark of the dynamic nature of human behavior is its pervasive variability: People act differently in different situations, with different people, in different emotional states. Faced with the large and growing corpus of research evidence for *variability* in activity and development, researchers guided by static models have been continually surprised to find that children's performance is nowhere near as stable as the static conceptions predict. A child who can solve an arithmetic problem (or a social problem) one day or in one situation frequently cannot solve the same problem the next day or in a different but apparently similar situation. Different children of precisely the same age often cannot perform the same cognitive tasks—sometimes in relation to cultural contexts or family environment, sometimes for reasons that are harder to explain. Even from moment to moment, a person performs a task differently as she or he adapts to variations in the situation, social context, or emotions of self and others. Indeed, when the data of cognitive developmental research is taken as a whole, variability in the level of psychological performance is the *norm,* not the exception.

The task of developmental science is to detect and describe patterns in this variability and to propose models to account for data patterns that reflect both stability and variability. We show how the concepts and methods of dynamic structural analysis provide a framework and tools for analyzing this variability and detecting the order in it—key findings such as the emergence of qualitatively new cognitive abilities or the transitions from one behavior to another.

In our view, performances vary so greatly because psychological structure is not static but naturally produces variability in activity and development arising from people's constructive self-organization of their own psychological structures in relation to situations, other people, meaning systems, and their own bodies. Far from being a problem, patterns of developmental variability are the key to understanding the organization of these dynamic systems and the constructive processes by which human agents create new interrelations and thus new structures. The complexity of these systems is not something to be controlled for but to be described and understood. The patterns of variability that arise from the particular ways in which cognitive systems are organized are the key to understanding that organization and thus to understanding psychological structure. Tools from dynamic systems analysis provide ways of embracing the variability to find the order in it.

With this chapter, we present a framework for conceptualizing psychological structure in dynamic systems constructed by human agents. We show how this model describes and explains patterns of developmental variability in terms of the structures human beings build. The chapter begins with an introductory overview of dynamic structuralism as a general approach to development, elaborating a theoretical model of psychological structure as the dynamic organization of self-constructed, socially embedded skills and activities (actions and thoughts). We contrast this position with traditional static views of psychological structure, which dominate scientific dialogue in what amounts to a modern synthesis of traditionally opposed viewpoints of nativism and empiricism. These static views derive from reductionist scientific theory inherited from the Cartesian tradition in philosophy, which leads to systematic misunderstanding of the nature of psychological structure and blatant failures to explain the extent of developmental variability.

The dynamic framework and research tools specifically crafted for analyzing development and learning provide a research methodology for the study of psychological structures including both their variability and the order in the variation. These concepts and tools apply to both long-term development and short-term microdevelopmental variations in the building of dynamic structures, providing powerful methods for testing dynamic hypotheses about variation, change, and stability. Broad in scope and applicability, the dynamic structural model and methodology elucidate relations between cognitive, social, emotional, and neurological development—which all work together in the activities of human beings in all their rich complexity.

DYNAMIC STRUCTURALISM

One reason psychological structure has so often been treated as static is that theorists have confounded structure with form. *Structure* refers to the *system of relations* (Piaget, 1970) by which complex entities such as biological organisms and psychological activities are organized. There are systematic relations, for instance, between the nervous system and the cardiovascular system such that each supports and responds to the other. The relations between these systems are in a constant balance or equi-

librium, which can only be maintained by constant activity on the part of each subsystem. Thus, systems of relations—structures—are necessarily dynamic.

Form is an *abstraction from structure*—a fixed pattern that can be detected in a dynamic structure. An orange has cellular and tissue-level structure, which lead to its cohesion in a spherical shape. The structure of the orange is dynamic, emerging developmentally, maintaining a dynamic equilibrium for a time, and then decaying. The concept of sphere, on the other hand, is an abstract form that we apply to describe one characteristic of the dynamic structure: the shape it produces. Beyond the orange, the concept of sphere is an ideal form that applies across myriad realities. The fact that this formal concept is unchanging across many situations is what makes it useful in describing similarities in many different objects such as balls, plums, or planets.

A structure/form problem arises when an abstraction used to describe reality is confounded with the reality described. People commonly expect patterns of phenomena in the world to conform to their underlying abstractions, instead of determining which patterns fit an actual object or experience. In personality and social relations, people commonly expect others to fit the stereotype of, for example, a shy, introverted person or a mother (Greenwald et al., 2002). Similarly, in science, researchers who focus on the sphere form may be surprised that baseballs, basketballs, and soccer balls are so different from one another, and researchers who focus on innate knowledge may be surprised to find that a 3-year-old really does not understand the numbers 1, 2, and 3 even though an infant can distinguish arrays of 1, 2, and 3 dots (Spelke, in press). For the sphere, the logical fallacy is obvious: The spherical shape is an abstraction of a common pattern across different objects, not an independently existing form that somehow dictates what the objects should be like. The same fallacy applies to the stereotypes and the nativist explanation of number.

This form fallacy has frequently led to perplexity among scientists and educators who expect patterns of thought and action to conform to an independently existing form such as stage, cognitive competence, or core knowledge. Scholars have been puzzled when a child reaches a certain stage or competence for one task or situation and he or she does not evidence the same ability in other tasks or situations, as if an underlying abstract logic could determine an individual's performance in the real world (Piaget, 1985). The attempt to preserve formal conceptions of structure in the face of ever growing evidence of variability in cognitive performance has led developmental theorists into pointless arguments over, for example, which of many varying performances represent an individual's "real" logical ability, or at what age children "really" acquire a concept like object permanence. We demonstrate later how the confounding of form with structure has led to an explanatory crisis in developmental science with ever more tortured attempts to explain the pervasive evidence of variability in static conceptions of structure as form. (We also see hopeful signs that the field is shifting to deal more centrally with the dynamics of variation.)

Dynamic structuralism offers an alternative to static conceptions of structure, starting with the recognition of the complexity inherent in human psychological development and the central role of the person in constructing dynamic systems of action and thought. Instead of trying to eliminate or get beyond the complexity of relations among systems, dynamic structuralism uses the tools of contemporary developmental science to analyze patterns in the complexity—how the constructive activity of human agents leads to new relations among systems of action and thought. The analysis of the dynamic structures of human behavior provides a way of simplifying without discarding complexity, identifying the essential relations among systems, and explaining activities and developmental pathways in terms of those essential system relations. Dynamic structuralism thus differs from the classic structuralism of Piaget (1983), Chomsky (1995), and others, which isolates structure from the variability of mental dynamics, treats it as static, and attempts to explain development in terms of the static forms.

Variability in the Middle of Things: An Example of Representing Social Interactions

Focusing on the pervasive variability of human activity, dynamic structuralism analyzes the patterns of stability and order in diverse patterns of activity in the variation (Bidell & Fischer, 1992; Fischer, Yan, & Stewart, 2003; Siegler, Chapter 11, this *Handbook,* Volume 2; Thelen & Smith, Chapter 6, this *Handbook,* this volume; van Geert, 1998). As in the study of ecology, the analysis begins *in medias res,* in the middle of things. Starting in the middle of things means that people's activities are embodied, contextualized, and socially situated—understood in their ecology (Bronfenbrenner & Morris,

Chapter 14, this *Handbook,* this volume; Cairns, 1979; Gibson, 1979) as well as their structure. People act and understand through their bodies acting in the world, not through a disembodied mind or brain. The brain and nervous system always function through a person's body and through specific contexts composed of particular people, objects, and events, which afford and support the actions. People act jointly with other people within culturally defined social situations, in which activities are given meaning through cultural frames for interpretation (Rogoff, 1990). Action in context is the center of who people are and how they develop (Brandtstädter, Chapter 10, this *Handbook,* this volume; Lerner & Busch-Rossnagel, 1981).

Starting in the middle of things with embodied, contextualized, socially situated individual and joint activity requires two major steps: (1) to describe basic structures or organizations of activities in context and (2) to characterize how those structures vary as a function of changes in key dimensions of person, body, task, context, and culture. Whether the focus is on knowledge, action, emotion, social interaction, brain functioning, or some combination, the dynamic structural approach puts the person in the middle of things and frames the person's activity in terms of multiple components working together. The maturity or complexity of people's behavior varies widely and systematically from moment to moment and across contexts, states, and interpretations or meanings. Each individual shows such variations, in addition to the wide variations that occur across ages, cultures, and social groups.

Consider, for example, the wide variation documented for children's stories or narratives about positive and negative social interactions (Fischer & Ayoub, 1994; Hencke, 1996; Rappolt-Schlichtman & Ayoub, in press; Raya, 1996). The developmental level, content, and emotional valence of a child's stories vary dramatically as a function of priming and immediate social support, emotional state, and cultural experience. For example, the activities of 5-year-old Susan demonstrate some of the variations in both developmental complexity and emotional organization that have been documented in research. First, she watches her counselor act out a pretend story with dolls: A child doll named after Susan makes a drawing of her family and gives it to her father, who is playing with her. "Daddy, here's a present for you. I love you." Then the daddy doll hugs the girl doll and says, "I love you too, and thanks for the pretty picture." He gives her a toy and says, "Here's a present for you too, Susan." When asked, the girl promptly acts out a similar story of positive social reciprocity, making Daddy be nice to Susan because she was nice to him.

Ten minutes later, the counselor asks the girl to show the best story she can about people being nice to each other, like the one she did before. Instead of producing the complex story she did earlier, she acts out a much simpler story, making the Daddy doll simply give lots of presents to the child doll, with no reciprocal interaction between them. There is no social reciprocity in the story but only a simple social category of nice action.

A few minutes after that, when the girl has spontaneously shifted to playing at fighting, the counselor shows her another nice story about father and child. This time, when the girl acts out her story, she switches the content from positive to negative with energetic aggression. The girl doll hits the Daddy doll, and then he yells at her, "Don't you hit me," slaps her in the face and pushes her across the room, showing the violence that often appears in the stories of maltreated children. The girl doll cries and says she is scared of being hit again. Note that, despite the shift to negative affect, Susan sustains a story involving social reciprocity: The Daddy doll hits the Susan doll because she had hit him, and she becomes afraid because he had hit her.

Then Susan becomes agitated; yelling, she runs around the room and throws toys. When the counselor asks her to do another story, she makes the dolls hit and push each other with no clear reciprocity and no explanation of what is happening. With her distress and disorganization, she no longer acts out a complex aggression story but is limited to stories of repeated hitting, even when she is asked to produce the best story she can. She uses a simple social category of mean action.

What is the "real" story for the child? Does she represent relationships between fathers and daughters as positive or negative? Is she capable of representing reciprocity, or is she not? These are the kinds of questions that are often asked in child development, but these questions assume an opposition that makes no sense. Susan plainly shows four different "competences"—positive reciprocity, positive social category (without reciprocity), negative reciprocity, and negative social category. Depending on the immediate situation, her emotional state, and the social support from her counselor, she demonstrates each of these four different "abilities." Her four skills vary strongly in both emotional valence and developmental level (complexity) with the different skills linked to the social context, her emotional state, and her relationship with her father and her counselor.

Different contexts for assessment routinely produce such substantial variations, although most developmental theories and methods do not deal with this variability. Children (and adults) show distinct levels of competence under different conditions, even for a single domain such as stories about nice and mean social interactions between peers (A. Brown & Reeve, 1987; Fischer, Bullock, Rotenberg, & Raya, 1993). Figure 7.1 shows the best (most complex) performances of eight 7-year-old children who were acting in (a) several contexts in which an interviewer provided high social support for complex stories, such as prompting the gist of the plot, and (b) several contexts providing no such support. As the context shifted, the children's competence for representing mean, nice, or nice-and-mean social interactions shifted dramatically and systematically. Every individual child showed a similar pattern of shifting across conditions—competence at step 6 or 7 for high-support conditions, and competence at step 2, 3, or 4 for low-support conditions. This variation is an example of *developmental range,* the spread between competence with high support and competence with little support. With both positive and negative stories, Susan demonstrated a developmental range varying from interactions with social reciprocity to interactions based on a single, nonreciprocal category. For example, she showed a higher competence of social reciprocity when the interviewer first demonstrated a story of nice reciprocity for her and a lower competence of nonreciprocal social interaction when she later made up a story without the interviewer's demonstration. Labeling her as having or understanding social reciprocity misrepresents the range of her competence, as does labeling her as having only a nonreciprocal social category.

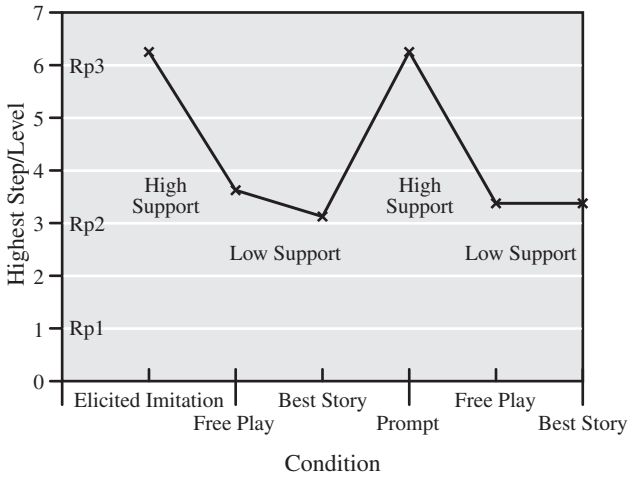


Figure 7.1 Variation in competence for stories as a function of social-contextual support. In the high-support assessments the interviewer either modeled a story to a child (Elicited Imitation) or described the gist of a story as well as some content cues (Prompt), and then the child acted out or told a similar story. In the low-support assessments the interviewer provided no such support but either asked for the best story the child could produce (Best Story) or let the child make up a number of stories in free play with the most complex story determining the child's "competence" for this context (Free Play). Children had performed similar stories several times before the assessments graphed here. The y-axis indicates steps in the assessed developmental sequence, as well as skill levels (Rp1 to Rp3), which will be explained later. *Sources:* From "The Dynamics of Competence: How Context Contributes Directly to Skill" (pp. 93–117), by K. W. Fischer, D. H. Bullock, E. J. Rotenberg, and P. Raya, in *Development in Context: Acting and Thinking in Specific Environments—The Jean Piaget Symposium Series,* R. H. Wozniak & K. W. Fischer (Eds.), 1993, Hillsdale, NJ: Erlbaum; and "The Effects of Development, Self-Instruction, and Environmental Structure on Understanding Social Interactions," by E. J. Rotenberg, 1988, *Dissertation Abstracts International, 49*(11), p. 5044B.

Depending on their emotional state, children also show different emotional valences in their representations, just as Susan did in her shift to negative stories. Maltreated children often shift the content of stories from positive to negative, and, when they become agitated, the sophistication of their negative stories deteriorates and remains low until they become calmer (Ayoub & Fischer, in press; Buchsbaum, Toth, Clyman, Cicchetti, & Emde, 1992).

These kinds of variations need to be center stage and the focus of developmental analysis. Only by including these variations as a function of context, culture, state, and other key contributors to behavior can scholars build an effective framework for explaining the many shapes of human development. Dynamic structuralism provides concepts and tools for founding developmental explanation and description of these variations, and it encourages the building of theory and method that capture the rich complexity that is the legacy of the human species.

Dynamic Nature of Psychological Structure

What is psychological structure? Why is it important in explanations of development? The answers depend on assumptions about the nature of the mind and its relation to other biological, psychological, and social phenomena. Psychological structure is the organizational property of dynamic systems of activity, and analysis of dynamic structure starts with assumptions that are fundamentally different from the traditional view of

structure as static form. The concept of structure in stage theory and related viewpoints equates form with structure and thus founders on the "discovery" of variability in development (as do most other traditional psychological concepts). The continued dominance of the structure-as-form paradigm has prevented an adequate resolution of the crisis of variability in developmental theory.

To build successful models of dynamic psychological structure, it is essential to understand how dynamic structure differs from static form. An essential first step is to focus simultaneously on variability and stability. Indeed, the neglect of variability helps ensure that models remain static, missing the sources of order in the variation and treating structures as static forms. Any adequate account of psychological structure must explain not only the stability that allows systems to function and maintain themselves over time and space but also the wide variability that arises from the dynamics of self-organizing systems. Models of psychological structure must specify mechanisms by which activities are organized dynamically in relation to multiple influences that are biological, psychological, and social.

In this section, we illustrate how a dynamic structural framework deals with variability and stability simultaneously and thus introduces powerful explanations of development, including cognition, social interaction, emotions, and even brain development.

Dynamic Structure in Living Systems

All living systems—whether biological, psychological, or social—must be organized to function. A living organism that becomes sufficiently disorganized dies. A disorganized society collapses. A disorganized mind leaves a person helpless in the face of everyday problems. This organizational aspect of living systems is what we call *structure,* a dynamic patterning and relating of components that sustain the organized activities that define life and living things.

To say that a system is structured or organized implies that specific relations exist among its parts, subsystems, or processes. In the human body, for example, the respiratory, circulatory, digestive, metabolic, and nervous systems must all function in very specific relations to maintain the overall functioning and health of the organism. Similarly in a complex society, the economic system, judiciary, political/electoral system, and government must maintain specific relationships to sustain the society. In this way, dynamic structure exists only where relationship exists, and relations among the parts of a system provide its specific organization.

To flourish, living systems must be more than just organized. They must be dynamic. Systems must constantly move and change if they are to carry out their functions and maintain their integrity and their interrelations with other functioning systems. A system that becomes static—unable to change and adapt to varying conditions—will quickly perish. Social, psychological, or biological systems must be able to stretch the limits of their current patterns of organization, and even to actively guide and reorganize the relations that constitute their structure. An organism or society that becomes inflexible and incapable of adaptive response to variations in its environment will die as surely as one that becomes disorganized. Thus, structure must be distinguished not only from disorganization but also from static form, which really is the antithesis of structure. Structure is fundamentally dynamic because it is a property of living, changing, adapting systems. Susan demonstrated this dynamic adaptation in her variable representations of social interactions with her father and counselor. Dynamic variation is a fundamental property of human action and thought.

The human mind is a specialized living system that participates in and with other bodily, environmental, and social systems. The specialized function of the human mind is to guide and interpret human activity in relation to the world of people and objects. The activity takes places *in medias res,* in the middle of things, not in the person alone or in the brain. The objects and people in the physical and social world of the actor are actually part of the activity.

Moreover, living systems are *agentive*—self-regulating and self-organizing, adapting and changing as a consequence of goal-oriented activity, as in Susan's activities (Bullock, Grossberg, & Guenther, 1993; G. Gottlieb, 2001; Kauffman, 1996). In seeking its goals, a living system is involved in multiple relations with other living and nonliving systems, and they are part of one another's dynamics.

This agency and interaction lead naturally to variability in systems. If systems were static, they would be unchanging; but because they move and change, they give rise to patterns of variability. The more complex a system, the more relations are entailed by its structure and the greater the variability it is likely to display. Human beings show more variability in activity than lizards,

rats, or monkeys. This variability can easily elude overly simple theoretical models that ignore the dynamic complexity and interrelationships of living systems.

Variation and Order in Development: The Constructive Web

People unknowingly ground their concepts and activities in metaphoric frames that give meaning (Lakoff & Johnson, 1999). Concepts and theories in science derive from metaphoric frames in the same way as everyday concepts, except that research systematically tests their grounding in observation and action. Traditional static conceptions of development in psychological structure are closely related to the widespread cultural metaphor of a ladder. Development is conceived as a simple linear process of moving from one formal structure to the next, like climbing the fixed steps of a ladder. It matters little whether the steps of the ladder are conceived as cross-domain stages, levels of a domain-specific competence, or points on a psychometrically based scale. In each case, the beginning point, sequence of steps, and endpoint of the developmental process are all linear and relatively fixed, forming a single ladder. With such a deterministic, reductionist metaphor, it is difficult to represent the role of constructive activity or contextual support because there appears to be no choice of where to go from each step. The richness of children's development, including the variability in their skills across contexts, is simply lost with the ladder metaphor. Development means just moving to the next step—an overly simple theory that clearly does not capture the variability that Susan showed in her stories about nice and mean interactions.

A more dynamic metaphor for development, which includes variability as well as stability in development, is the constructive web (Bidell & Fischer, 1992; Fischer et al., 2003). The metaphor of a web is useful for dynamic models because it supports thinking about active skill construction in a variety of contexts and for diverse variations. Unlike the steps in a ladder, the strands in a web are not fixed in a determined order but are the *joint product* of the web builder's constructive activity and the supportive context in which it is built (like branches, leaves, or the corner of a wall, for a spider web). The activity of an agent in constructing a web is particularly clear. For example, a given strand may be tenuous at first, dependent on surrounding strands for external support, and like the spider, the person can reconstruct it until it becomes a stable part of the web. Also, unlike most spider webs, human developmental webs are constructed jointly by multiple agents, not by an individual alone, although most psychological research examines individuals isolated from their social networks. We show how people often join together to construct parts of their developmental webs.

The separate strands in a web represent the various pathways along which a person develops. The strands in a web can start in a number of places, take a variety of directions, and come out at a range of endpoints, all determined by active construction in specific contexts. The several strands composing one line may be constructed in a different sequential order from the strands composing another line in a different section of the web. At the same time, there is order in the web, including similar orderings of spatial positions for some strands, separations and junctions of strands, and related starting and ending points for some strands. Using the constructive web as a metaphor for devising models of development facilitates the unpacking of variability relating to constructive activity and context, which are conflated in the image of a linear ladder of static structures.

Figure 7.2 depicts an idealized constructive web. The lines or strands represent potential skill domains. The connections between strands represent possible relations among skill domains, and the differing directions of the strands indicate possible variations in developmental pathways and outcomes as skills are constructed

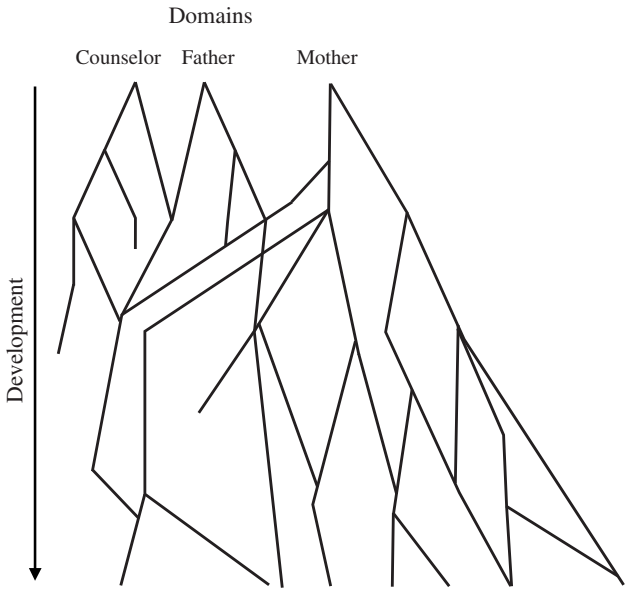


Figure 7.2 Development as a constructive web.

for participation in diverse contexts. Groupings of strands represent domains of skill, such as mother, father, and counselor, for each of the three clusters of strands. Within each strand, people's activities also vary, demonstrating a developmental range (like Susan's) varying between high competence with contextual support and lower competence without it (Fischer, Bullock, et al., 1993; Fischer et al., 2003). In the discussion that follows, the web metaphor is articulated to facilitate analysis of variability in the development of dynamic skills.

DYNAMIC STRUCTURE IN COGNITIVE AND EMOTIONAL DEVELOPMENT

To explain both variability and stability in development and learning, an alternative framework is needed to replace the structure-as-form paradigm as a basis for research and interpretation. Static conceptions of psychological structure must be replaced with dynamic ones such as the constructive web. Reified notions of structures existing separately from human activity must give way to a new understanding of structure as the dynamic organization inherent in the activity itself. Such a framework is emerging in dynamic systems theory, which is influencing a variety of fields and a growing number of researchers. (This volume shows the extent of the growth of dynamic systems in human development, with a majority of chapters taking a dynamic systems perspective.)

Common in many dynamic systems models is a shift in the treatment of order and variation from being dichotomized to being intrinsically related (Hua & Smith, 2004; Kelso, 1995; Port & van Gelder, 1995; van Geert, 1998). Phenomena that were once viewed as random or chaotic are now seen as organized in complex ways that lead to specific patterns of variation. Descriptions and models of the activity and change start with analysis of relations between organization and variability in specific phenomena. For instance, the jagged patterns of seacoasts—seemingly erratic jumbles of random erosions—can be closely modeled with fractal geometry, revealing an intrinsic organization to a geologic process of erosion and sedimentation once thought of as disorderly. By recognizing that organization is related to variability, geologists and mathematicians have been able to create models of the dynamic organization of the erosion process that can predict and explain the variability observed in the changing coastline (Kruhl, Blenkinsop, & Kupkova, 2000). Similarly, biologists model the structures of evolution of living organisms (Kauffman, 1993) and the dynamics of brain functioning and development (e.g., Marcus, 2004; Polsky, Mel, & Schiller, 2004; Spruston & Kath, 2004).

Full realization of the potential of dynamic systems analysis requires not only connecting nonlinear dynamic concepts to psychological processes but also building explicit dynamic models of those processes. Global concepts can be powerful and useful, but ultimately they must be tested out as models with explicitly defined properties. Only with such models can researchers determine whether the processes they hypothesize in fact produce the dynamic patterns of development and variation that they expect (Fischer & Kennedy, 1997; Thelen & Smith, Chapter 6, this *Handbook,* this volume; van der Maas, 1995; van Geert, 1998; van Geert & van Dijk, 2002). Happily, computer-based tools including spreadsheets such as Excel can be readily used to build explicit dynamic models and test them against empirical data.

From a dynamic systems viewpoint, psychological structure is the actual organization of systems of activity. It is not a separately existing entity, such as a logical stage dictating behavior, or a preformed linguistic or cognitive capacity awaiting actualization, but instead is a property of human activity systems. Because real systems of activity are dynamic—constantly moving, adapting, and reorganizing—they must be dynamically structured. Variability is a natural consequence of system dynamics, and because systems are organized, the variability is not random but patterned, as evident in the variable stories that Susan told. Just as geologists have modeled the structures of coastal evolution and biologists have modeled the structures of evolution of living species, developmental scientists can build models of the dynamic structures of development and learning in human action and thought.

To move beyond a general call to dynamic structural analysis and model the dynamics of development successfully, scholars need specific psychological constructs that support analyzing structures behind variation for particular research problems. There is not one correct construct for a dynamic approach to psychological structure. A number of contemporary constructs are useful for this purpose because they have been developed specifically to facilitate analysis of variation and organization of activities in context. The concept of script, for example, focuses on the organization and variation in everyday activities for storytelling, narratives, goals, and recall for scripted activities in specific contexts (Fischer, Shaver, & Carnochan, 1990; Nelson,

1986; Schank & Abelson, 1977). The concept of strategy has a long history of illuminating variations in the organization of problem-solving activity (Bruner, Goodnow, & Austin, 1956; Siegler & Jenkins, 1989; Siegler, Chapter 11, this *Handbook,* Volume 2). Concepts such as apprenticeship (Rogoff, 1990), environmental niche (Gauvain, 1995), and setting (Whiting & Edwards, 1988) facilitate analysis of the dynamic social organization of activities across contexts.

A construct that we find especially useful for facilitating a dynamic approach to psychological structure is *dynamic skill;* it provides a useful way of integrating many of the necessary characteristics of dynamic psychological structure into a single, familiar idea (Fischer, 1980b; Fischer & Ayoub, 1994; Fischer, Bullock, et al., 1993). This construct is based on concepts that were central to the cognitive revolution of the late 1950s and 1960s (Bruner, 1973; Gardner, 1985), the ecological revolution of the 1960s and 1970s (Bronfenbrenner & Morris, Chapter 14, this *Handbook,* this volume; Gibson, 1979), and the emotive revolution of the 1980s and 1990s (Campos, Barrett, Lamb, Goldsmith, & Stenberg, 1983; Frijda, 1986; Lazarus, 1991). These revolutions have emphasized, for example, the importance of goals, self-regulation, organism-environment interaction, bias or constraint, and the social foundations of activity. Most importantly, Piaget (1970) and Vygotsky (1978) insisted on activity as the basis of cognitive structures, defined as systems of relations among activities.

In the following discussion, we explicate the construct of dynamic skill, using it to articulate essential characteristics of psychological structures. We show how the dynamic analysis of structure can both predict and explain specific patterns of developmental variability, focusing on three key types of variability frequently observed in developmental research: (1) sequence, (2) synchrony, and (3) range. In subsequent sections, we show how these dynamic characteristics differ from those in static views of structure, and we describe key methodology for studying the dynamics of change, microdevelopment in learning and problem solving, development of emotion, and the role of brain functioning in development of cognition and emotion.

Psychological Structure as Dynamic Skill

In ordinary English usage, the term *skill* both denotes and connotes essential characteristics of the dynamic organization of human activities (Bruner, 1973; Welford, 1968). Skill is the capacity to act in an organized way in a specific context. Skills are thus both action-based and context-specific. People do not have abstract, general skills, but they have skills for some specific context: a skill for playing basketball, another for telling a children's story, or yet another for interpersonal negotiation. Skills do not spring up fully grown from preformed rules or logical structures. They are built up gradually through the practice of real activities in real contexts, and they are gradually extended to new contexts through this same constructive process (Fischer & Farrar, 1987; Fischer & Immordino-Yang, 2002; Granott, Fischer, & Parziale, 2002).

The concept of skill also helps to conceptualize the relations among various psychological, organismic, and sociocultural processes and to cut through artificial dichotomies between mind and action, memory and planning, or person and context. A skill—such as telling children stories about emotional interactions with other children—draws on and unites systems for emotion, memory, planning, communication, cultural scripts, speech, gesture, and so forth. Each of these systems must work in concert with the others for an individual to tell an organized story to specific children in a particular context, in a way that it will be understood and appreciated. The concept of dynamic skill facilitates the study of relations among collaborating systems and the patterns of variation they produce and inhibits treating psychological processes as isolated modules that obscure relations among cooperating systems. To see how, let's consider some of the characteristics of skills.

Integration and Interparticipation

Skills are not composed atomistically but are necessarily integrated with other skills. The skill of playing basketball demands that many other skills, such as running, jumping, and visual-motor coordination, all be integrated to function in a coordinated way. Integrated skills are not simply interdependent but *interparticipatory.* True integration means that the systems participate in one another's functioning. Atomistic models allow for simple interdependence: The stones in an arch, the trusses in a bridge, the modules in a serial computer comprise atomistic systems in which parts are interdependent but do not obviously participate in each other's functioning.

In contrast, the components of living systems not only depend on one another but participate in one another. Although at first this concept may seem counterintuitive, there are many obvious examples in familiar processes such as human cellular or organ systems. Any

system in the human body is composed of multiple subsystems whose boundaries defy definition. The cardiovascular system, for example, participates in the functioning of every organ system, because every organ depends on receiving oxygenated blood. At the same time, the cardiovascular system includes components from the nervous system, the muscular system, and so forth, so that these other systems in turn participate in the circulatory system. It makes little sense to think of any of these systems as functioning outside the context of the other systems: Living systems die when cut off from the other systems with which they interparticipate. For living systems, conceptions of structure must reflect the interparticipation of one system in another.

Systems of activities are central parts of living systems, especially in complex systems such as human beings. Activities organize into skills, which have many interparticipating components. When Susan creates a story of social reciprocity between the positive actions of the doll Susan and her doll father, the actions of each character affect each other intimately and reciprocally—they participate in each other. Skills normally involve this interparticipation of components.

Context Specificity and Culture

Skills are context-specific and culturally defined. Real mental and physical activities are organized to perform specific functions in particular settings. The precise way a given skill is organized—its structure—is essential to its proper functioning, as well as specific to that skill at any moment. Good basketball players do not automatically make good baseball players; good storytellers in one culture do not automatically have their stories understood and appreciated in other cultures.

The context specificity of skills is related to the characteristics of integration and interparticipation because people build skills to participate with other people directly in specific contexts for particular sociocultural systems. In turn, people internalize (Cole, 1996; Wertsch, 1979) or appropriate (Rogoff, 2003) the skills through the process of building them by participating in these contexts; and as a result, the skills take on cultural patterning. Similarly, component systems such as memory, perception, emotion, and even physiological regulation all participate in the culturally patterned skills. The context specificity of skills thus implies more than simply a fit with an environment. Even systems like perception or memory, which are often thought of as being isolated from sociocultural systems, are linked to them through the skills in which they participate; research shows how pervasive and deep the connections are (Greenwald et al., 2002; Mascolo, Fischer, & Li, 2003).

Self-Organization, Mutual Regulation, and Growth

Skills are self-organizing. Part of the natural functioning of skills is that they organize and reorganize themselves. These self-organizing properties go beyond maintenance to include growth of new, more complex skills. One of the goals of developmental science is to analyze the processes of organization and change, which skills undergo with development and learning. Unlike mechanical systems that must be built and maintained artificially through an external agency, the agency that creates and maintains skills (and living systems in general) resides in the activities for both individual activity and social interaction. Construction and maintenance of skills involves both self-regulation and mutual regulation with other people, because components interparticipate. In an obvious example from human biology, as people increase their activity level, their increased use of energy and oxygen evokes increases in their rates of breathing and metabolism. No outside agency is involved in adjusting the controls for this interparticipation of motor systems with respiratory and metabolic systems. The living system actively adjusts itself to maintain its own integrity.

In skills, the components regulate each other in the same way. Susan's and her father's mean actions toward each other mutually affected the other's mean actions, creating adaptations in content, organization, and emotional tone (quality and intensity). Skills are not fixed abilities but constantly adapting, regulated activity structures. As Susan, her father, and her counselor act together, they develop new skills together, coordinating activities that were previously relatively independent to form newly integrated wholes. Through coordination and mutual regulation, they organize their activities into qualitatively new, integrated systems, with sequences of coordinations and regulations that build on each other.

Dynamic structuralism provides concepts and tools for taking hold of this adaptive variability to uncover the order behind the variations. One of the central discoveries is a common scale of hierarchical complexity that orders the variations.

A Common Ruler for Skill Development

A key ingredient for advancing developmental science is common rulers (scales) for measuring change and varia-

tion in activity, similar to the Centigrade or Fahrenheit scale for temperature and the meter or foot for length. These scales should be grounded in properties of natural response distributions and applicable across tasks and domains. However, psychological measurement has produced mostly arbitrary scales based on one situation such as those for intelligence, achievement, and personality tests. They do not use naturally occurring response distributions but statistical models assuming stable (static) ability and normal distributions (van Geert & van Dijk, 2002; Wahlsten, 1990), and they assess behavior in one situation, the test. A more useful scale allows measurement of different skills in various situations and is not tied to one situation or assessment instrument. Temperature and length can be measured in many ways in virtually any situation.

Fortunately, the measurement problem has now changed with the discovery of a common scale for behavioral complexity that captures a central dimension of both long-term development and short-term change (Commons, Trudeau, Stein, Richards, & Krause, 1998; T. L. Dawson & Wilson, 2004; Fischer, 1980b; Fischer & Immordino-Yang, 2002). Research with various methods has produced evidence for the same scale, marked by clusters of discontinuities such as sudden changes in growth patterns and gaps in Rasch scaling. Analysis of growth curves has documented these patterns (Fischer & Rose, 1999; van Geert, 1998), and Rasch (1980) scaling of interview and test data has shown remarkably consistent evidence of the same patterns of discontinuity (Dawson, 2003; Dawson, Xie, & Wilson, 2003), forming a scale of at least 10 levels of hierarchical complexity, as shown in Figure 7.3. The scale relates to the outline of developmental stages that Piaget (1983) described, but the levels on the scale are better grounded empirically, and performance varies across the scale instead of being fixed at one point at each age. The scale also has important similarities to those suggested by Case (1985), Biggs and Collis (1982), and others. Interestingly, discontinuities in growth of brain activity seem to follow the same scale, as described later in the chapter (Fischer & Rose, 1996).

Many developmental scientists have posited stages, some of which match some of the levels (Biggs & Collis, 1982; Case, 1985; Halford, 1982; McLaughlin, 1963), but these alternatives have not been based on clear empirical criteria for what constitutes a stage or level—and what does not (Fischer & Silvern, 1985). Typically, these investigators have merely described a sequence of posited cognitive reorganizations without specifying empirical criteria for stages or levels, except for loosely defined "qualitative change" and an approximate developmental sequence.

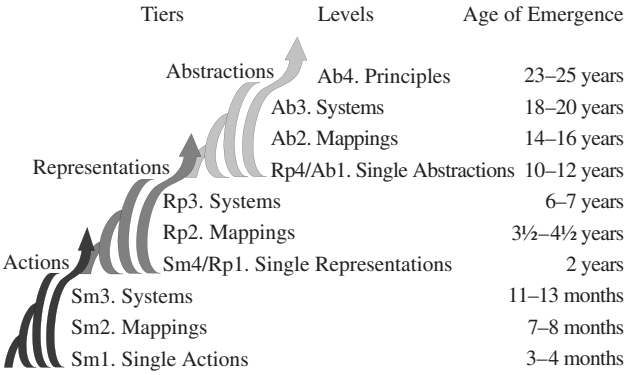


Figure 7.3 Developmental cycles of levels and tiers of skills. Development proceeds through 10 levels of skills grouped into three tiers between 3 months and adulthood. The ages of emergence are for optimal levels, the most complex skill that a person can perform with social-contextual support, based on research with middle-class American or European children. They may well differ across social groups. There is some evidence for an additional tier of innate action-components in the first few months of life. *Sources:* From "A Theory of Cognitive Development: The Control and Construction of Hierarchies of Skills," by K. W. Fischer, 1980b, *Psychological Review, 87,* pp. 477–531; and "The Big Picture for Infant Development: Levels and Variations" (pp. 275–305), by K. W. Fischer and A. E. Hogan, in *Action in Social Context: Perspectives on Early Development,* J. J. Lockman & N. L. Hazen (Eds.), 1989, New York: Plenum Press.

The skill scale in Figure 7.3 begins with sensorimotor actions, which are coordinated through several complexity levels to eventually form representations, which are in turn coordinated through several levels to form abstractions, which continue to develop into adulthood. The larger growth cycles of actions, representations, and abstractions are called *tiers* (left column of the figure), and the specific changes marked by clusters of discontinuities are called *levels* (middle column). The ages in the right column indicate when skills at a level first emerge under conditions that support optimal performance. Each level has a characteristic skill structure, as shown in Figure 7.4, and similar structures recur in each tier, reflecting a dynamic cyclical growth process. The structures begin with single sets organized as actions, representations, or abstractions. A person coordinates and differentiates these sets to form mappings, which in turn are coordinated and differentiated to form systems.

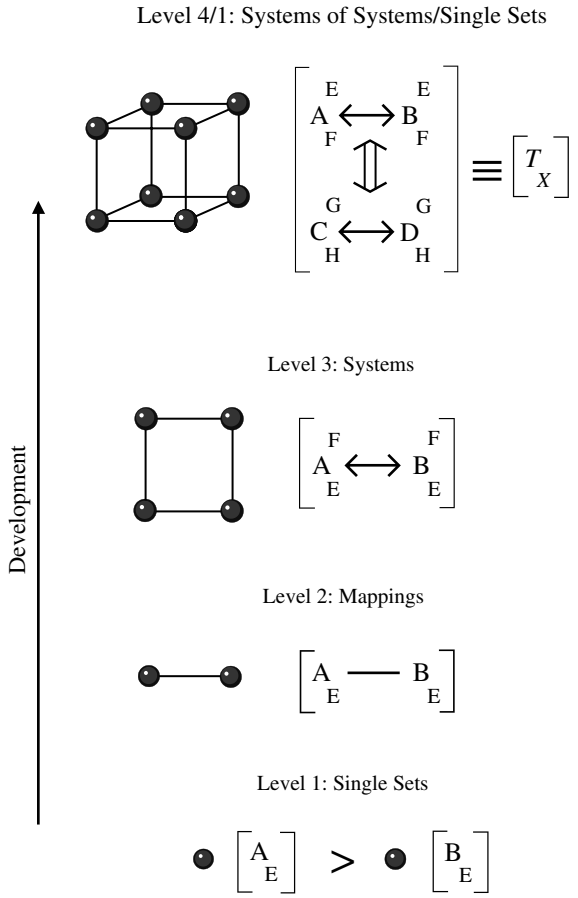


Figure 7.4 Cycle of levels of development for a tier: cube models and skill structures. The fourth level marks the culminating structure for a tier and the formation of a new unit for the next tier, as shown by the two skill formulas for Level 4/1: Level 4 actions form Level 1 representations, and Level 4 representations form Level 1 abstractions.

In skill formulas, brackets mark a skill structure; and each letter denotes a skill component, with a large letter designating a main component (set) and a subscript or superscript a subset of the main component. A line connecting sets (—) = A mapping relation, a single-line arrow (↔) = A relation forming a system, a double-line vertical (⇳) arrow = A relation forming a system of systems, and a greater than symbol (>) = A shift from one skill to another without integration. Such shifts between skills can occur at every level, although for simplicity a shift is shown only at the first level. For skill formulas in later figures and text, bold letters = Sensorimotor actions, italic letters = Representations, and script letters = Abstractions.

At the fourth level of each tier, the person coordinates and differentiates systems to form systems of systems, thus constructing a new unit that begins the next tier—a single set of a new type. At the tenth level, the person constructs single principles, and there is as yet no evidence for further levels marked by clusters of discontinuities beyond single principles (Fischer et al., 2003).

Contrary to static approaches to development and learning, the levels on the scale do not indicate the use of one psychological structure or module across domains, like one of Piaget's (1985) generalized logical structures or Chomsky and Fodor's (1983) modules. People do not use the same structure across situations, but they build skills along the same scale. The processes of growth and variation produce skills that fit a common scale across tasks and domains, but the skills used differ, being dynamically adapted to context, emotional state, and goal. The complexity of separate activities varies in similar ways for different contexts and states. Think of temperature, for which physicists discovered a common scale over the last several hundred years. The same scale can be used to measure the temperature in the sun, Antarctica, a refrigerator or furnace in New York, a person's mouth, or the bottom of the ocean. Thermometers measure with a common scale across radically different situations and methods, even with great differences in the ways that heat and cold occur.

In this way, skills are organized in multilevel hierarchies that follow the scale in Figures 7.3 and 7.4. People construct skills through a process of coordination, as when 5-year-old Susan built stories about emotionally loaded social interactions that coordinated multiple actions into social categories and then coordinated social categories into reciprocal activities. Susan used a skill hierarchy in which individual pretend actions (Sm3 systems of actions) were embedded in social categories (Rp1 single representations), which were in turn embedded in socially reciprocal activities (Rp2 representational mappings). Existing component skills, controlling activities in specific contexts, were intercoordinated to create new skills that controlled a more differentiated and integrated range of activities. In the newly integrated skills, the component skills still functioned as subsystems in the new skill as a whole. They also could still be used alone, as when Susan dropped back to simpler actions with less contextual support or with emotional upset. We use representations of positive and negative social interactions to ground the explanation of dynamic skills and to illustrate how the skills in the diagrams both develop in the long term (macrodevelopment or ontogenesis) and vary from moment to moment (microdevelopment).

The skill hierarchy in the scale embodies the principles of self-organization and interparticipation of dynamic

systems. As skills become integrated and differentiated at later levels, the component skills subordinate themselves to new forms of organization and mutual regulation. The very process of creating new skills through self-organizing coordination leads to a multileveled hierarchical structuring of living skills. Indeed, "hierarchy" in this sense has a special meaning. Computer programs, for example, can be arranged hierarchically in the sense that lower-level outputs feed higher-level procedures, but this organization does not typically involve interparticipation and self-organization.

Generalization through Construction

Susan built her skills for representing positive and negative social interactions in one context, but she naturally tried to generalize those skills across related contexts—for example, using the skills for representing interactions with her father to build representations of interactions with her counselor. The process of skill construction through coordination is closely related to skill generalization, and the complexity scale can illuminate both. Generalization of mental and physical activity involves specific building of generalized skills driven by the goal-oriented activity of an individual or ensemble (a few people working closely together), especially for socially constructed domains such as literacy, mathematics, and science. Generalization in these domains is not a predetermined, innate outcome waiting for development to catch up with it, as some nativists would have it (Baillargeon, 1987; Fodor, 1983; Spelke, 1988). Several mechanisms of generalization of dynamic skills through coordination, differentiation, and bridging from simple to complex have been specified with some precision (Fischer & Farrar, 1987; Fischer & Immordino-Yang, 2002; Siegler & Jenkins, 1989). Studying microdevelopment is an especially powerful way of analyzing processes of dynamic generalization, as we describe in a later section to illuminate how learning general knowledge takes a long time.

Building a Constructive Web for Positive and Negative Social Interactions

The complexity scale combines with the constructive web in Figure 7.2 to support analyzing psychological structure in dynamic terms. Unlike the traditional ladder of development, the web highlights integration, specificity, multiple pathways, active construction, and other central properties of skill development (Bidell & Fischer, 1992; Fischer et al., 2003). Building a web is a self-organizing process in which a person coordinates and differentiates various activities along the complexity scale. The strands in a web are the joint product of the person's constructive activity and the contexts in which skills are built, including the other people who coparticipate in building them.

We use stories about nice and mean social interactions to illustrate properties of the constructive web and its relation to dynamic properties of cognitive and emotional development. Telling a story or narrative is a fundamental human activity. To produce a specific story or narrative, a child needs to organize activities in a scriptlike way, following specific patterns of sequencing of events (Bruner, 1990; Fischer et al., 1990; Ninio & Snow, 1996; Schank & Abelson, 1977). This organization helps impart meaning to the narrative, as with 5-year-old Susan's stories about interaction between a girl and her father. Without this script organization, the story becomes a meaningless jumble; for example, it becomes unclear who is being nice to whom and why, or who is hurting whom and why. Yet the organization of the storytelling activity must also be flexible, so that a storyteller can create new versions for changing situations and people, thereby communicating different ideas and feelings, as Susan changed her stories in relation to her emotional state and to the contextual cuing and support she received from the adult interviewer.

Like other skills, the complexity and organization of story skills varies widely with the dynamics of the constructive activity, including story complexity, emotional state, and social-contextual support from other people. The skill scale illuminates this variation by providing a ruler for analyzing and comparing these variations. When 5-year-old Susan is in a positive mood and has support from her counselor, she organizes a complex story about positive interactions. A few minutes later when she is emotionally stressed, she no longer produces a complex positive story, even with support from the counselor, but instead tells an equally complex negative story. When the counselor does not provide contextual support, Susan can organize only a simpler positive or negative story. In addition, the form of narrative organization varies across cultural groupings and discourse communities because individuals construct different narrative skills to participate in different culturally patterned communicative activity. Susan's

stories fit her cultural community, but would have to be reorganized to fit others.

Webs and Biases

Figure 7.5 shows a developmental web for stories about positive and negative social interactions in American children of diverse ethnicity and social class (Ayoub & Fischer, in press; Fischer & Ayoub, 1994). When children play, they commonly act both nice and mean to each other, and like 5-year-old Susan, they readily act out and tell stories about positive and negative interactions between peers. The web has three distinct strands

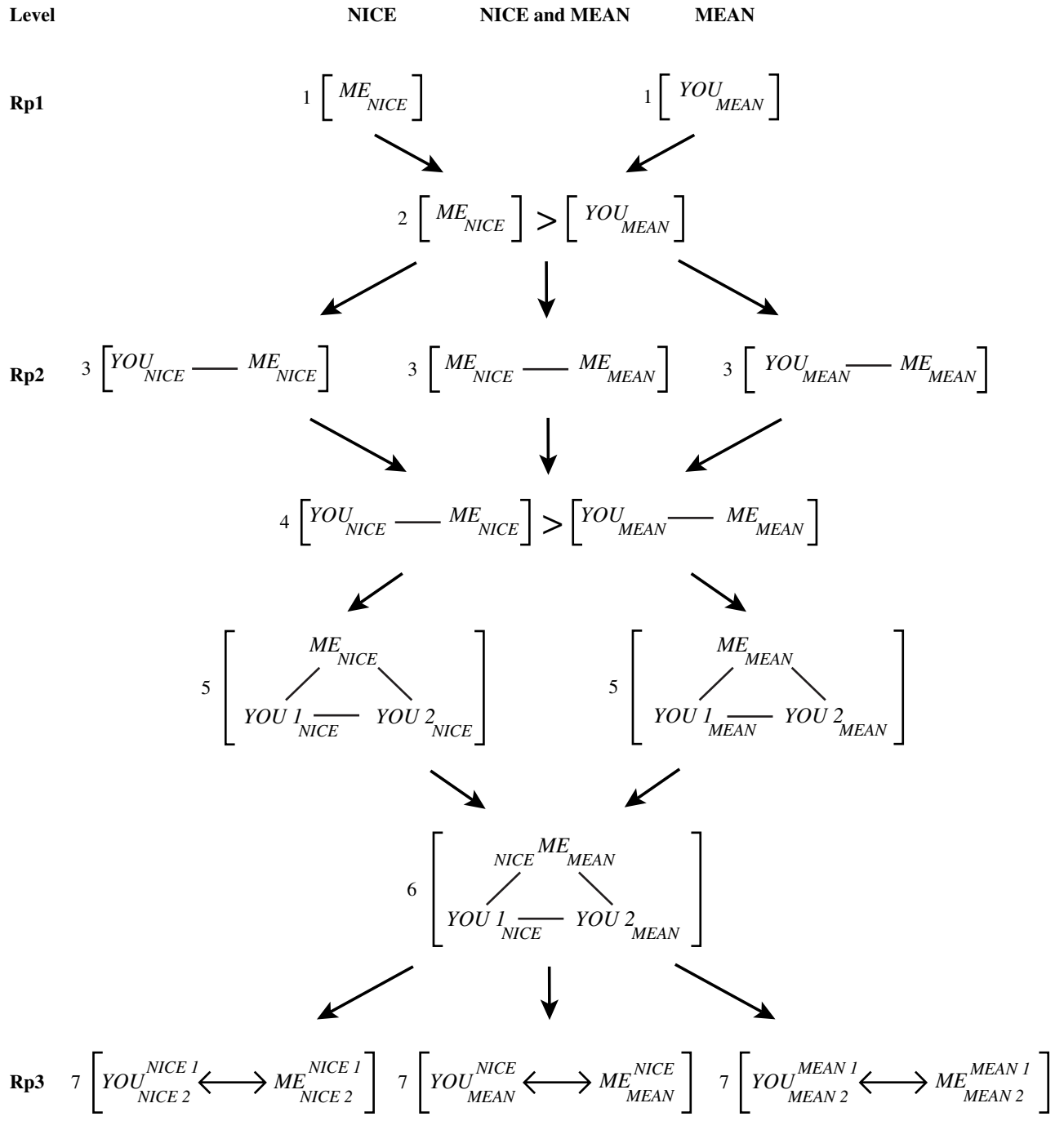

Level
NICE
NICE and MEAN
MEAN
Rp1
1 [ME NICE]
1 [YOU MEAN]
2 [ME NICE] > [YOU MEAN]
Rp2
3 [YOU NICE — ME NICE]
3 [ME NICE — ME MEAN]
3 [YOU MEAN — ME MEAN]
4 [YOU NICE — ME NICE] > [YOU MEAN — ME MEAN]
5
ME NICE
YOU 1 NICE — YOU 2 NICE
5
ME MEAN
YOU 1 MEAN — YOU 2 MEAN
6
NICE ME MEAN
YOU 1 NICE — YOU 2 MEAN
Rp3
7 [YOU NICE 1 NICE 2 ⟷ ME NICE 1 NICE 2]
7 [YOU NICE MEAN ⟷ ME NICE MEAN]
7 [YOU MEAN 1 MEAN 2 ⟷ ME MEAN 1 MEAN 2]

Figure 7.5 Developmental web for nice and mean social interactions. The numbers to the left of each set of brackets indicate the step in complexity ordering of the skill structures. The words inside each set of brackets indicate a skill structure. The left column designates the first step at each skill level.

organized by emotional domains of different valence—nice on the left, mean on the right, and the combination of nice and mean in the middle. The tasks are ordered in steps by skill complexity, marked by the numbers next to each skill structure. There are normally multiple steps per level, marking the distinct points in the construction process that can be discriminated for a particular situation, which can vary in number. The levels are indicated in the left-hand column.

In the research, children between 2 and 9 years of age told stories about two or three boys or girls playing together, with each story reflecting one of the three emotional domains. One character usually had the name of the child telling the story, and the others represented his or her friends or siblings; in some studies, the characters had the names of unknown children. In a separate assessment, children also told similar stories about parent-child interactions.

Later steps generally involve more inclusive skills, constructed by the coordination and differentiation of lower-level components. For example, in step 3, the story involves a mapping between two instances of niceness (or meanness), similar to the reciprocity stories of Susan: One doll acted mean (or nice) to a second doll who because of the first doll's action, acted mean (or nice) in return. In Figure 7.5, each diagram of *YOU* or *ME* acting *NICE* or *MEAN* represents a story with a certain skill structure, varying across the three skill levels of single representations, mappings, and systems. The structure

$$\left[YOU_{NICE} \text{ —— } ME_{NICE} \right] \qquad (1)$$

represents a mapping for reciprocity: If you are nice to me, I will be nice to you. Vertical arrows between specific story structures in Figure 7.5 indicate developmental sequencing for those stories, as when steps 3, 4, and 5 in the left column form part of a pathway along the strand for nice. The skill formulas focus on the central elements that children had to control in the nice/mean stories: roles (you or me), emotional valence (nice or mean), and relations between roles (shifts without coordination, mappings, and systems). Like structures in any living system, these elements subsume many additional components hierarchically within them such as actions, perceptions, feelings, goals, and social expectations.

Thus, each step in Figure 7.5 represents a different level of skill at conceptualizing relations among social interactions. Children's stories develop along strands for each of the content domains of nice, mean, and nice-and-mean in combination. When stories are parallel from left to right, they emerge at approximately the same time in development. Their development also shows many connections among the strands.

In accord with the general tendency for researchers to neglect within-person variation and emphasize between-person variation, people sometimes misunderstand this developmental web, interpreting it to mean that different children are developing along each strand. To the contrary, each child develops simultaneously along each of the strands in the web in Figure 7.5. That is, each child is simultaneously developing understandings about positive valence (how nice interactions occur), negative valence (how mean interactions occur), and combined valence (how nice and mean can be combined in an interaction). When the three strands are all closely parallel, with no clear bias toward one or the other, then the web looks like Figure 7.5, with complexity as the primary determinant of developmental ordering. Steps of the same complexity are parallel in the web, independent of valence.

One characteristic of emotions, however, is that people typically show biases in their actions and thoughts. Biases toward certain action tendencies are one of the defining characteristics of emotions, as is discussed in the later section on Emotional Development. Emotional biases often have strong effects on a developmental web; they shift relations between strands, and they change developmental orderings. For the nice-and-mean web, one far-reaching emotional bias is a general favoring over time of one pole of evaluation—toward positive (nice) or negative (mean). One of the most strongly established findings in social psychology is that most people show positive biases in their activities and evaluations, especially for attributions about themselves (Higgins, 1996; Osgood, Suci, & Tannenbaum, 1957). Figure 7.6 shows a global bias toward the positive.

Although positive biases are pervasive, there are also many instances of negative biases. Powerful biases toward the negative can be produced by trauma such as child abuse (Ayoub, Fischer, & O'Connor, 2003; Westen, 1994) and by implicit attitudes (Greenwald et al., 2002). When children show a strong and persistent bias toward the negative and against the positive, their entire developmental web is shifted (biased) in the opposite direction than in Figure 7.6—toward the negative pole. That is, mean interactions are understood earlier than nice ones, and the combination of

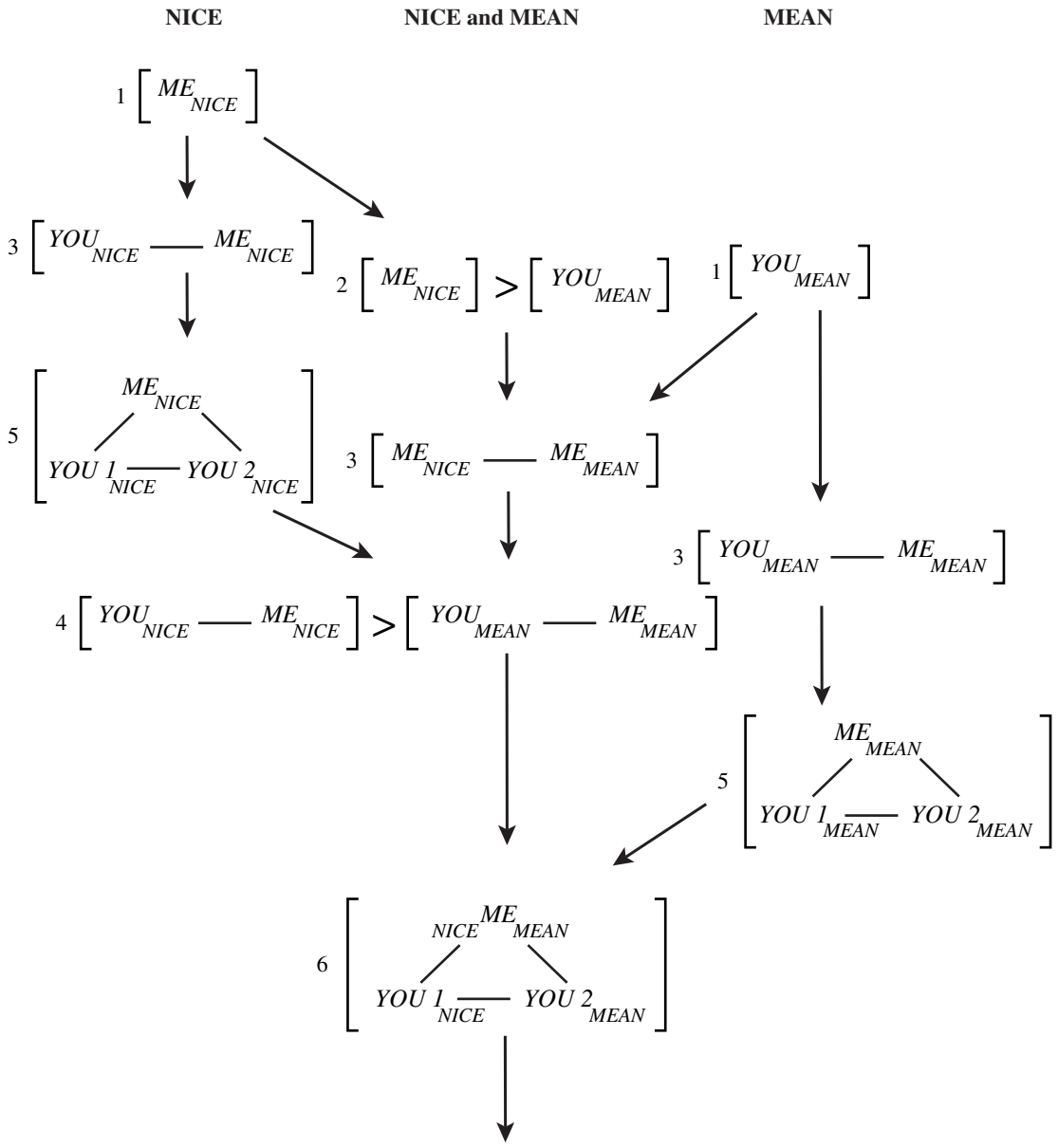

NICE
NICE and MEAN
MEAN
1 [ME NICE]
3 [YOU NICE —— ME NICE]
2 [ME NICE] > [YOU MEAN]
1 [YOU MEAN]
5 [ME NICE / YOU 1 NICE —— YOU 2 NICE]
3 [ME NICE —— ME MEAN]
3 [YOU MEAN —— ME MEAN]
4 [YOU NICE —— ME NICE] > [YOU MEAN —— ME MEAN]
5 [ME MEAN / YOU 1 MEAN —— YOU 2 MEAN]
6 [ME NICE ME MEAN / YOU 1 NICE —— YOU 2 MEAN]

Figure 7.6 Developmental web biased toward nice interactions. This web includes only the first two-thirds of the skills from the web in Figure 7.5.

nice and mean is delayed as well. A number of abused children and adolescents show an alternative developmental pathway based on this bias toward the negative (Fischer et al., 1997; Rappolt-Schlichtman & Ayoub, in press). Besides the long-term effects of experience, there are short-term within-person effects as a function of context, mood, and similar factors, as when being in a negative mood leads to a bias toward negative stories. In this way, developmental webs can be useful for representing variations in developmental pathways not only between people but also within a person over time.

Modeling Nonlinear Dynamic Growth in a Web

Besides the representations of weblike relations between steps and strands like those in Figures 7.2 and 7.5, various tools can be useful for analyzing different properties of development. One example that can be particularly powerful is mathematical modeling of growth functions (Singer & Willett, 2003). Each strand in a web

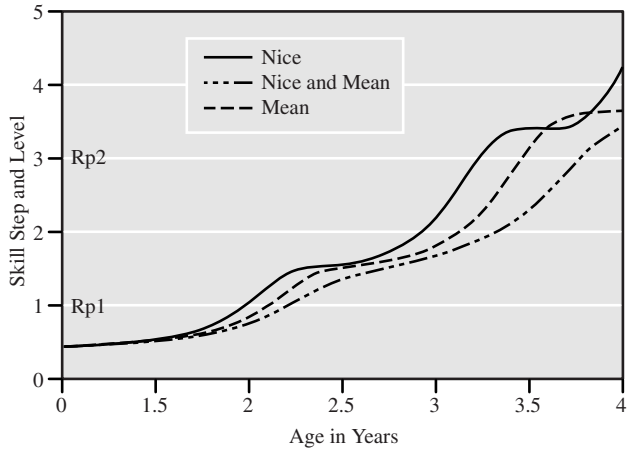


Figure 7.7 Growth functions showing a bias toward nice interactions. Skill Step refers to the complexity ordering in Figure 7.5. Level refers to the level of hierarchical complexity in Figure 7.3.

can be described in terms of its growth function, which in this case is represented by a nonlinear dynamic growth model (Fischer & Kennedy, 1997; van Geert, 1991, 2003). Figure 7.7 shows an example of growth curves produced by the model for each of the three strands.

The growth model includes a global positive bias like that in Figure 7.6, and under certain conditions, it also produces stagelike jumps in development, which are discussed in the next section. Complexity scaling provides the metric for quantifying growth of the strands, with scaling tools provided by dynamic skill theory. The graph clearly represents the bias toward positive valence and away from negative and combined valences, emphasizing the quantitative advantage of the nice strand over the others. The graph also highlights the fits and starts in growth and the relations between them—something that is not evident in the web diagram. However, this quantitative graphing de-emphasizes the ordering relations among specific story structures, which are clearly marked in Figures 7.5 and 7.6. Different tools for analysis of developing activity structures capture different properties of the structures, and no single tool captures all important aspects.

How Dynamic Skills Explain Variability in Development

The characteristics of skills, including the weblike process of skill construction, can help both explain and predict patterns of variability that have eluded traditional static accounts of psychological structure. In this section, we show how three basic forms of systematic developmental variability—(1) complexity level, (2) sequence, and (3) synchrony—can each be explained by the characteristics of dynamic skills. In a subsequent section, we consider issues of methodology and measurement used in the precise description and prediction of variability in development.

Developmental Range: Optimal and Functional Levels

Children (and adults) routinely perform across a range of skill levels, like Susan telling stories about nice and mean at two different levels with her counselor. A fundamental error stemming from static conceptions of psychological structure is that each individual is treated as "possessing" one fixed level of structure, either across domains or in a domain, as if cognition were a sealed bottle with a fixed level of liquid in it. From this point of view, an individual's behavior is expected to be homogeneously consistent with the fixed level of cognition such as the number of items that a child can sustain simultaneously in working memory. Deviations from this fixed level then seem mysterious and appear to call for complicated explanations. Often the deviations are ignored, as researchers mistakenly use methods that sum across individuals, activities, and contexts and treat true variations in level as errors of measurement (Estes, 1956; Fischer, Knight, & Van Parys, 1993; Skinner, 1938; van Geert & van Dijk, 2002).

A person possesses different competences in different contexts and emotional states. The types and complexities of organization found in dynamic skills are always changing because (a) people constantly vary their activities as they adjust to varying conditions and coparticipants, and (b) people commonly reorganize their skills to deal with new situations, people, and problems. For instance, a tennis player plays at top level one day—after a good night's rest, on an asphalt court, against a well-known opponent. The same player plays at a much lower level the next day, with a bad night's sleep, on a clay court, against a new adversary. This reduction in the player's skill level is a real change in the organization of activity, not a departure from some underlying stage or competence that is the "real" thing. The person unconsciously changes the actual relationships among the participating systems of perception, motor anticipation, motor execution, memory (for instance, of the other player's strengths), and so on. These relations

constitute the dynamic structure of skill. The level of organization of tennis skills varies because coordination among the systems is different on the 2 days. To posit any additional layers of abstract competence or stage structure to explain this variation is unnecessary, as it is accounted for by the dynamic properties of real activity systems.

Comparable variations in skill level occur in most skills, from playing tennis to interacting socially, planning a party, and reasoning about scientific or literary questions. Vygotsky (1978) spoke of the zone of proximal development (ZPD) and the variation between performances as a result of presence and absence of scaffolding by an expert. Our research has documented an important principle of variation in this zone: the developmental range introduced earlier, which is the interval between a person's best performances with and without social contextual support in some domain. Susan showed a developmental range in her construction of stories about nice and mean interactions.

In a study of nice and mean stories, 7-year-old children telling stories under conditions of high and low social-contextual support showed a consistent developmental range, repeatedly changing to a high level with support and a lower level without it, as shown in Figure 7.1 and Table 7.1 (Fischer, Bullock, et al., 1993). A typical 7-year-old produced a highest story at step 3 (Level R2, representational mappings) under low-support conditions but achieved step 6 (Level Rp3, representational systems) under high-support conditions. The interval between these two developmental levels (a child's developmental range for this domain) is indicated in Table 7.1, which is based on the data in Figure 7.1. The highest skill level when functioning independently (under low support) for a given domain is referred to as the *functional level.* The highest level with high-support conditions is the *optimal level.*

The interval of variation for a given skill can extend even farther, as suggested in Table 7.1. Social support often goes beyond prompting or modeling to actual coparticipation in a task (also called *scaffolding*), where, for example, an adult takes on acting out the role of one of the dolls in a story with a child. With scaffolding, the level of task performance can be extended several steps upward because psychological control of the activity is shared with an expert. In contrast, circumstances such as emotional stress, fatigue, distraction, or interference by a coparticipant can lead a person's skill level to fall below his or her functional level.

Developmental range seems to characterize performance across most tasks, ages, and cultures, and it grows larger with age, at least through the late twenties (Fischer, Bullock, et al., 1993; Fischer et al., 2003). Most people experience the developmental range directly when they learn something new with a teacher or mentor. With the prompting of the teacher, they understand a new concept or control a new skill at a relatively high level. Without the prompting, their level of skill drops precipitously such as when they leave the classroom and try to explain the new concept to a friend who knows nothing about it.

A study of Korean adolescents' conceptions of themselves in relationships illustrates the striking gap that commonly occurs between optimal and functional levels, as shown in Figure 7.8 (Fischer & Kennedy, 1997; see also Harter & Monsour, 1992; Kennedy, 1991). In this study, adolescents participated in the Self-in-Relationships Interview (SiR), which assessed developmental level under two conditions (described in more detail in the section on Methodology of Dy-

TABLE 7.1 Developmental Range of a 7-Year-Old Telling a Story with Varying Social Support

Step	Skill Level	Performance Level	Social Support
1	Rp1		
2			
3	Rp2	Functional level	None
4			
5			
6	Rp3	Optimal level	Priming through Modeling, etc.
7			
8	Ab1	Scaffolded level	Direct participation by adult
9			

Note: Functional and optimal levels are upper limits on performance, which show stability for a task. Scaffolded level involves a range of performance indicated by the vertical line on the left, with the specific step depending on the nature of the scaffolding in combination with the 7-year-old's skill.

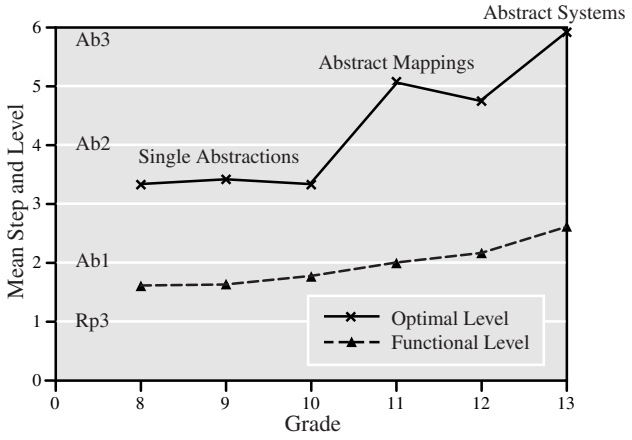


Figure 7.8 Range of developmental levels for Self-in-Relationships Interview in Korean adolescents.

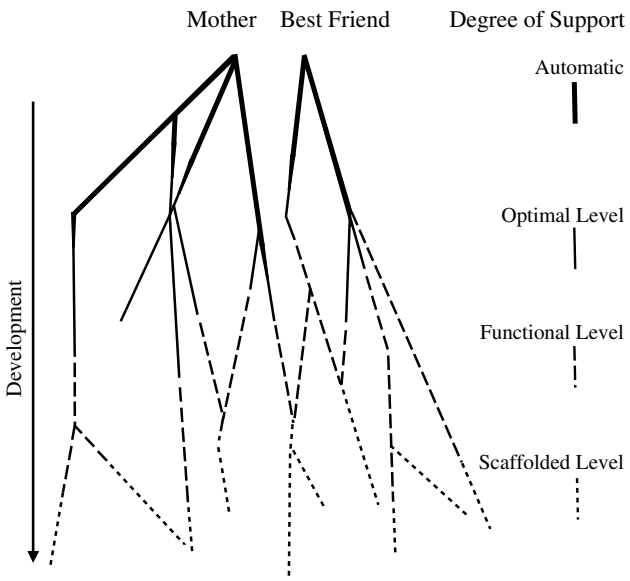


Figure 7.9 Developmental range of a web for two relationships.

namic Structural Analysis). For the optimal-level condition, high support involved the construction by each adolescent of a detailed diagram of his or her own descriptions of self in several different relationships such as with mother, father, sibling, best friend, and teacher. The diagram as well as the interview questions supported optimal performance by prompting key components of skills. For the functional-level condition, low support involved a relatively open-ended interview that was similar to most traditional assessments of self for adolescents; they were simply asked to describe what they were like in each relationship and how their descriptions related to each other. There was no prompting of key skill components.

The constructive web provides another useful way of portraying variability in developmental level. Figure 7.9 represents a developmental web for an individual's conceptions of self in two important relationships, mother and best friend. Along each strand the heavy solid line indicates a well established, highly automatized skill for a given context. An individual's performance drops to this level in circumstances of high stress, fatigue, or interference. The thinner solid strand represents the functional level of independent control under normal conditions for this context—a level of skill organization that is well established but less automatic. The optimal-level skills indicated by the dashed lines are still under construction, occurring when the person receives modest contextual support such as modeling or prompting. Finally, the dotted lines indicate a skill level that the individual has recently begun to construct, in which the person can hold the component skills in an integrated structure only if there is direct scaffolding, coparticipation of a more capable partner.

From this perspective, it is easy to see why skill levels vary over a wide range. The variation is a direct consequence of the active, constructive, and context-embedded nature of human activity. As Figures 7.8 and 7.9 suggest, adolescents' conceptions of themselves in relationships are not fixed capacities but multilevel structures of dynamic skills under construction. Skills early in a particular developmental sequence are better integrated and more stable across time and conditions than skills more recently constructed or just starting to be constructed. Variability in the organization of a person's skill at holding in mind and organizing the events and characteristics of a social relationship are a natural consequence of these constructive dynamics. There is no need to invoke explanations in terms of formal stage structures or hidden competences hovering over and guiding activities. Variability is explained by constructive dynamics. The task is to build theoretical models and methods for describing and analyzing these dynamics.

The Dynamics of Stages and Developmental Synchrony

Besides explaining sources of variability in level, the concept of dynamic skill also provides a framework for facilitating analysis of processes of change in constructive dynamics. Specifying the conditions that lead to

variability, as in developmental range, allows the control and use of the conditions to analyze patterns of change. We have employed this control of conditions to illuminate a classic argument about processes of change, the stage debate (Bidell & Fischer, 1992). Traditionally the dialogue about stage has not always been informative, amounting to assertion without accommodation:

Stage proponent: "There are stages of cognitive development."
Nonstage proponent: "No, there are no stages."
Stage proponent: "Yes, there are."
Nonstage proponent: "No, there aren't."

Instead of arguing about whether stages exist, dynamic skill analysis provides tools for specifying the conditions for stagelike change and those for continuous, nonstagelike change. Stages both do and do not exist, depending on the dynamics of the conditions of activity!

In the study of Korean adolescents, dynamic skill theory was used to predict the conditions and age intervals when growth shows discontinuous jumps in level versus smooth change. High-support conditions were predicted to produce two discontinuities marking the emergence of two new levels of coordination of abstractions. Figure 7.8 shows the predicted difference in growth functions: Optimal-level growth spurted twice, at grades 11 and 13, which are comparable to the ages of optimal-level spurts found in research with American and Chinese samples (Cheng, 1999; Fischer & Kennedy, 1997; Harter & Monsour, 1992; Wang, 1997). Researchers using the skill theory framework have observed similar patterns in other types of skills, in age groups ranging from preschool to adulthood (e.g., Corrigan, 1983; Fischer & Hogan, 1989; Fischer et al., 2003; K. Kitchener, Lynch, Fischer, & Wood, 1993). In each case, the developmental spurt is associated with a major transition in skill level such as the transitions to abstract mappings and abstract systems under optimal conditions in Figure 7.8. When optimal and functional levels are lumped together, this discontinuity is masked because the developmental function produced is effectively an average of two different developmental functions, a process that inevitably masks the true growth functions. In addition, there is much evidence of other kinds of discontinuities such as gaps in Rasch scaling and changes in brainwave patterns at similar points along the hierarchical complexity scale (Dawson, 2003; Dawson et al., 2003; Fischer & Rose, 1996).

As this and many other examples demonstrate, the developmental level of behavior varies with assessment context, coparticipant, state of arousal, emotional state, and goal, just to name a few of the most obvious sources of variation. Some researchers have argued that these variations demonstrate an absence of developmental stages (Brainerd, 1978; Flavell, 1982; Thelen & Smith, 1994), but these arguments overlook the order in the variability. The organization of behavior develops systematically, and it also varies from moment to moment. These facts are contradictory only for overly simple concepts of stage and variation. Real behaviors—and real neural networks as well—function not at a single level but in a range or zone (A. Brown & Reeve, 1987; Fischer, Bullock, et al., 1993; Grossberg, 1987; Vygotsky, 1978). Research to test for stagelike change must take this range into account and analyze which parts of the variation show stagelike characteristics and which do not. Only then will the field move beyond endless arguments in which protagonists focus on only part of the variation and thus draw half-baked conclusions.

The separation of optimal and functional is one example of the way a dynamic skills framework permits the prediction and explanation of patterns of variability that have typically been ignored or explained away by theories relying on static stage or competence models of psychological structure. Although researchers may differ with the specific interpretation given to a phenomenon like the discontinuities in optimal level, the constructive-dynamic framework described here makes it possible to debate the issues empirically, by providing concepts and research methodologies to control and manipulate variations in the developmental process. (These methodologies are described throughout this chapter; see also the section on Methodology.)

An important part of "stage" is the expectation of high developmental synchrony. Stage theories predict high stability across contexts in the level of performance an individual will display. The idea of a "hard stage," an underlying logical system pervading the mind at a given stage (Kohlberg, 1984; Piaget, 1985), implies that a given person should perform logically equivalent tasks at the same time regardless of state or context—say, Piaget's tasks of conservation of liquid and classification of shapes in matrices. It is as if Piaget touched children's heads on their seventh birthday, and instantly they were transformed into concrete operational thinkers. This strong "point synchrony" (simultaneous development of new levels across domains) is seldom empirically supported (Fischer & Bullock, 1981). Instead, children and

adults show a high degree of variability in levels across tasks and contexts, even with tasks that are logically similar. For example, children who understand tasks for conservation of number frequently fail tasks for conservation of liquid even when the procedures and questions are similar.

On the other hand, there is evidence of real developmental synchrony as well when dynamic concepts are used to analyze how and when synchrony does and does not occur. Equivalent concepts show what is sometimes called "interval synchrony," appearing not at the same time but within a relatively short time interval of each other. Moreover, this interval is much smaller for concepts about closely related topics measured in similar tasks, especially when there is a clearly defined conceptual structure that is ecologically valid (T. L. Dawson & Gabrielian, 2003; K. Kitchener & King, 1990; Pirttilä-Backman, 1993). The disparity in intervals between concepts drops as differences in content, context, and concept are reduced. Case and his colleagues (1996) have even shown that, with a well-defined central conceptual structure, teaching the structure increases the degree of synchrony across domains to the point that it sometimes accounts for approximately 50% of the variability—a remarkably large effect indicating high interval synchrony. Lamborn, Fischer, and Pipp (1994) demonstrated that development of understanding of specific moral concepts such as honesty and kindness related closely to relevant social problem-solving skills but not to other problem-solving skills.

The combination of systematic variability and synchrony is hard to explain with static concepts of psychological structure such as stage or competence. Piaget and other hard-stage theorists initially waved away evidence by arguing that different tasks posed different forms of resistance to structures of logic. The resulting *decalages* (time gaps) were said to result from different kinds of resistance, but the processes by which resistance functioned were never explained (Kohlberg, 1969; Piaget, 1971).

The principles of constructive dynamics explain patterns of variation in stage patterns and synchrony in a straightforward manner:

- Skills are constructed hierarchically by integrating earlier skills into a more inclusive whole.
- Skills vary across multiple levels for each individual depending on context, goal, state, support, and other factors. An important example is the developmental range.
- Skills are constructed for participation in specific tasks and contexts and over time can be generalized to others through specific generalizing activity (Case et al., 1996; Fischer & Farrar, 1987; Fischer & Immordino-Yang, 2002).

Even in the simple diagram of two domains in Figure 7.9, it is obvious that among the functional, optimal, and scaffolded levels, some skills will be the same across domains, and others will be different for the same domain. Taken together, these principles help explain how interval synchrony occurs as well as how people build general skills. This process is elaborated later in the section titled: Building Structures: Transition Mechanisms and Microdevelopment.

The scale for hierarchical complexity in Figures 7.3 and 7.4 provides a metric for assessing greater or lesser synchrony, moving beyond all or none arguments. For many related skills, levels do not show complete asynchrony but are relatively close even when they differ. The growth functions for nice and mean in Figure 7.7 illustrate how the same growth curves can simultaneously show similarities and differences in the ages of change. Stepping back to look at the broad sweep of change makes the synchronies evident; stepping close to look at the details of change highlights the disparities. Each new skill at a higher level is built from similar lower-level skills: Each extension of a skill to a new level is a constructive generalization constrained by the component skills available. There is no need to invoke pervasive logical structures or innately determined formal constraints to account for interval synchrony in development. The dynamics of the construction of skills in context explain both the variability and the synchrony found in patterns of variation.

Variability in Sequence of Acquisitions

Another form of variation involves the sequence in which skills for a given task or context are constructed, often called *developmental sequences* or *pathways.* Although evidence of variation in specific developmental sequences has been taken as evidence against hierarchically constructed stages (Brainerd, 1978; Gelman & Baillargeon, 1983), a dynamic structural analysis illuminates when sequences occur and when they do not, whereas stage and competence theories are hard pressed to account for observed patterns of variability and stability in sequences.

An examination of the evidence shows a familiar pattern: There is high variability in developmental

sequences, but this variability is neither random nor absolute. The number and order of steps in developmental sequences vary as a function of factors like learning history, cultural background, content domain, context, coparticipants, and emotional state. In addition, the variability in steps appears to be contingent on the level of analysis at which the sequence is examined (Dawson & Gabrielian, 2003; Fischer, 1980b; Fischer et al., 2003).

Developmental sequences tend to appear mainly at two levels of analysis: (1) large-scale, broad sequences covering long times between steps, relatively independent of domain, and (2) small-scale, detailed sequences found within particular domains. Large-scale sequences appear to be relatively invariant. Children do not, for instance, exhibit concrete operational performances across a wide range of tasks, and then years later begin to exhibit preoperational performance on related tasks. On the other hand, small-scale sequences have often been found to vary dramatically (Ayoub & Fischer, in press; Wohlwill & Lowe, 1962).

Typically, variation in small-scale sequences is associated with variation in task, context, emotion, coparticipant, or assessment condition. For instance, Kofsky (1966) constructed an eleven-step developmental sequence for classification of objects based on Inhelder and Piaget's (1964) concrete-operational thinking and used scalogram analysis to rigorously test the sequence. Her predicted sequence followed a logical progression, but it drew on an assortment of different tasks and materials to evaluate each step. The results showed weak scalability with several mini-sequences.

Other sources of variation in small-scale sequences include cultural background, learning history, learning style, and emotion. Price-Williams, Gordon, and Ramirez (1969), for instance, examined the order of acquisition of conservation of number and substance in two Mexican villages. The villages were comparable in most ways except that in one village the children participated in pottery making from an early age. Children of the pottery-making families tended to acquire conservation of substance (tested with clay) before conservation of number, while nonpottery-making children showed the opposite tendency.

Affective state can also powerfully affect developmental sequences (Ayoub & Fischer, in press; Fischer & Ayoub, 1994). For example, inhibited and outgoing children show different sequences in representing positive and negative social interactions, especially those involving the self. Inhibited children often show the positive bias in Figure 7.6. Extreme emotional experiences such as child abuse often lead to highly distinctive developmental sequences for representing self and others in relationships, as we discuss in the section on Emotions.

Furthermore, the failure to consider variation in sequences from factors such as learning style, disability, or cultural difference leads to combining undetected variations, with the result that task sequences erroneously seem to scale poorly (Fischer, Knight, et al., 1993). As soon as they are resolved into alternative sequences, they scale well. For example, a sequence of six tasks related to reading single words scaled weakly when tested on a sample of poor readers in first to third grades (Knight & Fischer, 1992). In each task, a child dealt with an individual word, reading it directly (Reading Production), reading it through matching it with a picture (Reading Recognition), producing a word that rhymes with it (Rhyme Production), recognizing a word that rhymes with it (Rhyme Recognition), naming the letters seen in the word (Letter Identification), or describing what the word means (Word Definition). Use of a scaling technique for detecting alternative sequences showed the existence of three different well-ordered sequences in the sample. Subsamples of poor readers showed sequences that reflected their specific reading difficulties.

The constructive web framework provides a tool for rethinking these patterns of variation in the constructive dynamics of skill development. Alternative developmental pathways can often be traced for different groups of children such as the three pathways for good and poor readers. When the standard metaphor of the developmental ladder is used, children are compared only in relative progress or delay on a single progression from low to high performance on a single sequence. As long as only a single pathway is considered, there seems only one remedial choice: to work to speed up the apparently delayed group along the "normal" pathway.

Figure 7.10 shows the three weblike pathways that the students take through the series of reading tasks. For each group, the order of acquisition for the six tasks was tested using *partially ordering scaling,* a statistical technique that is based on the logic of Guttman scaling (Krus, 1977; Tatsuoka, 1986). A line between two tasks means that the ordering is statistically reliable. A comparison of the three developmental pathways shows that the poor readers are not delayed with respect to a universal sequence, but actually follow *different* pathways of acquiring these skills. Normal readers all showed one

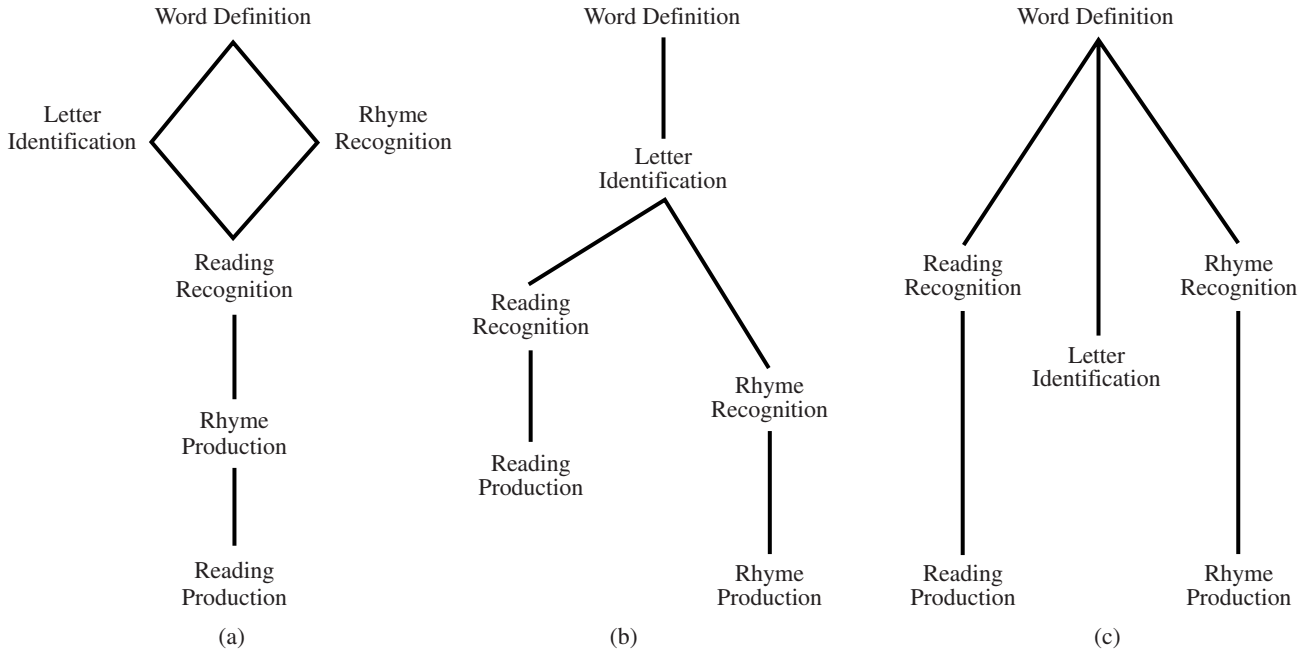


Figure 7.10 Developmental pathways of good and poor readers. The normative pathway for most good readers is shown in (a: Pathway 1: Normative developmental pathway for reading single words), whereas the two less integrated pathways followed by poor readers are shown in (b: Pathway 2: Independence of reading and rhyming), and (c: Pathway 3: Independence of reading, letter identification, and rhyming). From "Growth Cycles of Mind and Brain: Analyzing Developmental Pathways of Learning Disorders," by K. W., Fischer, L. T. Rose, and S. P. Rose, in *Mind, Brain, and Education in Reading Disorders,* K. W. Fischer, J. H. Bernstein, & M. H. Immordino-Yang (Eds.), in press, Cambridge, England: Cambridge University Press; From "Learning to Read Words: Individual Differences in Developmental Sequences," by C. C. Knight and K. W. Fischer, 1992, *Journal of Applied Developmental Psychology, 13,* pp. 377–404.

main pathway (a), but poor readers showed two other pathways different from the normal one (b and c).

This map of alternative pathways suggests a different remedial educational strategy. Instead of attempting to speed up development in poor readers, teachers can help channel children following divergent pathways into alternatives that converge on the goal of skilled reading (Fink, in press; Wolf & Katzir-Cohen, 2001). By providing environmental support, teachers can channel development, building bridges from the known to the unknown instead of providing frustrating repetitive encounters with the unknown. This approach is being realized most fully in educational efforts for children with learning disorders and handicaps (Fischer, Bernstein, & Immordino-Yang, in press; Rose & Meyer, 2002) and also in some work with maltreated and aggressive children (Ayoub & Fischer, in press; Kupersmidt & Dodge, 2004; Watson, Fischer, & Andreas, 2004).

From this perspective, the tool of mapping alternative developmental pathways is especially important for the study of development among children of differing socioeconomic groups, cultures, ethnicities, or races, and children with learning or psychological disorders. Against the backdrop of a developmental ladder based on White, middle-class norms, children from different social groups are frequently seen as exhibiting deficits in development. Within the web metaphor, many developmental differences become alternative pathways instead of deficits, and curricula, interventions, or therapies can be created based on these alternative pathways.

Research methods should allow detection of alternative sequences instead of forcing all children to either fit or not fit one sequence. Remarkably, much research on development has treated sequences not as variable phenomena to be explained but as fixed milestones in a ladder. In the early 1970s, Flavell (1971) and Wohlwill (1971) called for more research on variation in sequences, but this call has only recently begun to be taken seriously. Most neo-Piagetian developmental theories and domain theories still differentiate only gross stages, ignoring completely branches in sequences and variations among steps, with a resulting overgeneralization of the

uniformity and universality of cognitive and emotional development.

In summary, the organization of human action, thought, and emotion shows wide, systematic variation that can be measured, analyzed, and explained in hierarchically organized systems of contextually embedded activity. Patterns of variation in developmental level, synchrony, and sequence are all consistent with a constructivist, dynamic systems interpretation of psychological structure. In light of the pervasive evidence of cognitive variability, it seems surprising that the most prominent models of psychological structure have been and continue to be based on static conceptions such as stage, competence, and innate core knowledge. To understand why these static conceptions of structure continue to dominate and how dynamic views of psychological structure move beyond them, we consider the history and origin of static conceptions of psychological structure and their shortcomings as explanatory tools in the next section.

THE CRISIS OF VARIABILITY AND THE CARTESIAN SYNTHESIS IN DEVELOPMENTAL SCIENCE

The failure of developmental theory to recognize the dynamic and constructive nature of psychological structure has led to an explanatory crisis in developmental science. At the heart of this crisis is the problem of how to account for the tremendous variability in developmental phenomena, which during the past 30 years has increasingly moved from the background to the foreground of developmental research and theory (Bidell & Fischer, 1992; Damon, 1989; Siegler, 1994; Chapter 11, this *Handbook,* Volume 2; Thelen & Smith, Chapter 6, this *Handbook,* this volume).

The static stage structure, which dominated theories of cognitive development from its inception through the early 1980s, proved incapable of accounting for the massive evidence of (a) both wide-ranging variation and sometime consistency within and across individuals in the age of acquisition of logical concepts across domains and contexts, (b) systematic sequences in acquisition of many of these concepts and their components, and (c) variation from high to low synchrony in development of concepts under various conditions. By the mid-1980s, the inability of stage theory to account for this combination of variability and consistency led many scholars to virtually abandon stage theory as a framework and to launch a series of alternative accounts of psychological structure and its origin.

Many of these alternative accounts attempt to explain variability without departing from the static structure-as-form metaphor, but they have consistently come up short. Traditional Piagetians tried to package up variability in the concept of "decalage," which simply means a gap in ages of acquisition across tasks or individuals, and then mostly ignored it, thus renaming variability but not explaining it. Other theorists introduced a separation between competences or underlying structures that remain static and performances or surface manifestations that can vary. However, the separation of action from competence in competence-performance and nativist models introduces a major mystery about what interferes with the expression of competence and creates an inability to explain how psychological organization directs action and how structures adapt to a range of environmental and cultural contexts.

Why do developmental theorists cling to static structural models? The most important reason, we propose, is the pervasive influence of the Cartesian epistemological tradition in the history of Western psychological thought (Descartes, 1960; Gottlieb, Wahlsten, & Lickliter, Chapter 5; Overton, Chapter 2; Valsiner, Chapter 4, this *Handbook,* this volume). The Cartesian method conceptually isolates mental systems from their natural context of interrelations with the biological and cultural systems of which they are a part. This intellectual methodology of isolating an object of study from interrelationships with other phenomenon was successful in the early history of the natural sciences, but it obscures the complexity and dynamism of mental activity. It leads to systematic distortions when applied to the question of mental organization or psychological structure.

In this section, we review the Cartesian framework and the empirical debate surrounding the concept of "stage structure," showing how this debate led to the discovery of variability in level, synchrony, and sequence, and why the formal view of structure was unable to predict or explain this variability. We then argue that three major theoretical movements since stage theory—(1) domain specificity theory, (2) nativist competence theory, and (3) competence/performance theory—have also proved inadequate in accounting for variability in structural development because they too have failed to move beyond the Cartesian structure-

as-form paradigm. In the subsequent section, we describe a set of methods for moving beyond these approaches to do research that deals with variability more powerfully within a dynamic structural framework, including an outline of how to turn theories about developmental process into specific mathematical models that can be tested against growth patterns of individual children and adults.

The Cartesian Dualist Framework

The debate over nature-versus-nurture explanations of the origin of knowledge assumes the Cartesian framework, which is accepted by both sides—nature/nativist and nurture/empiricist. Grounded in the dualism of mind and world, the two sides necessarily imply one another. The nativist-rationalist tradition and the empiricist-learning tradition are two sides of the same Cartesian coin. The nativist branch of the Cartesian framework explains the origin of psychological structure as preformed innate structures such as concepts. The empiricist branch explains it as experience stamping its shape on the natural mind. Psychological structure, conceived as innate form, implies some outside input to be stored and manipulated. Environmental information conceived as preexisting packets of knowledge requires some sort of preexisting receptacle or organizing structure in the mind to receive, contain, and organize them. In this framework, only two explanations for the origin of psychological structure seem possible—nature or nurture—and they become the basis for the two branches of Cartesian epistemology.

The Cartesian tradition in philosophy and science brings with it the methodologies of reduction and reification. These methods, which have been profitably employed in many areas of science, result in systematic misconceptions when applied to dynamic processes like development of action, thought, and emotion. The dynamic organization of human mental activity is abstracted from the living systems of which it is a property and treated as a separately existing "thing," giving birth to the conception of static structure. The reification of psychological structure as a separately existing static form leads scientists down false paths in trying to understand the origins and development of psychological organization. Instead of seeking to understand the constructive, self-organizing processes by which children build new relations among contextually embedded mental activities, theorists have been led into the futile nature-nurture debate about whether statically conceived psychological structure is somehow insinuated in the genome or is built up through analysis of perceptual-motor experience. These reductionist assumptions support static views of structure and limit the explanatory power of developmental theories.

The Cartesian method, emerging in the seventeenth century philosophy of René Descartes (1960) and others, gave science a powerful analytical tool to sort out the complexity of the world and focus on one aspect at a time for study. This tool, known as Cartesian reductionism, derives simplicity out of complexity by isolating one aspect of a process from its relations with other aspects of the process or from related processes, to be studied independently. Descartes tried to extract mind from nature by creating a dualism in which a separately existing mental structure receives impressions from the outside world through the sensory apparatus. Descartes's famous dissection of the cow's eye, revealing the image projected on the retina, supported his view that innate structures are fed with sensory images from the environment. Similarly, in his logical empiricism the philosopher John Locke (1794) asserted that some preexisting logical structure is required to explain how environmental input leads to higher order knowledge. Locke saw that the simple mechanism of association of sensory impressions could not account for higher-order knowledge involving induction, deduction, and generalization. Like Descartes, Locke's account of knowledge acquisition involved a dualist conception in which a preexisting psychological structure receives and processes sensory input from the outside.

Although Cartesian reductionism has been and will continue to be an indispensable tool of scientific analysis, its strength—the isolation of phenomena from complex relations—is also its weakness (Wilson, 1998). When Cartesian reductionism is used exclusively as an analytic method, it eliminates an essential characteristic that needs to be understood—the interrelations of psychological systems both internally among component processes and externally with other systems. Understanding relations is a requisite for understanding change and variation in developmental or historical phenomena. In the real world, it is the interrelations among systems and processes that effect movement and change. The gravitational relation between the earth and the moon is key to sustaining the moon's orbit, which generates the changing cycles of the moon seen on earth. To ignore the gravitational relation between

earth and moon would preclude understanding the source of this pattern of variability, and in turn its explanation of an orbital system. The reductionist approach can be highly efficient for restricted scientific purposes such as isolating a particular strain of bacteria that causes a human disease. It is problematic in studying any complex phenomenon involving relations among elements and systems such as the problem of how some bacteria evolve more virulent strains in the modern context of changing natural and social ecology, growing poverty and hopelessness in many locales, and overuse of antibiotics. The structure grows dynamically out of the relations among varying systems, neither from a static innate structure nor a static environmental structure stamped on the mind.

The exclusive use of reductionism as an analytical method fosters the related problems of reification and dualism, both arising from the neglect of relations in theoretical constructs. Without an account of the relations among systems that can explain movement and change, abstractions such as mind, thought, and structure appear static and isolated from other constructs such as body, action, or function. These static abstractions reify the phenomena they refer to, treating dynamic processes as frozen objects. The self-organizing, goal-directed activity of the human agent is ruled out of the accounts of development.

Moreover, because the relations between such reified processes are lost, they seem isolated, separate, and even opposite to one another. This seeming opposition of reified abstractions is the basis for the classic Cartesian dualisms separating mind from body, thought from action, and structure from function. Since the time of Descartes, such dualist assumptions have become ingrained in the mainstream of Western scientific thought in general and psychological theories in particular. The result has been static accounts of psychological phenomena and their origins and sterile debates that explain mental processes by one or another reified abstraction such as faculties, associations, stimulus-response bonds, innate concepts, or stages. While such single-construct explanations have generated intense debate, they have been notoriously limited in accounting for a broad range of developmental data.

The Tacit Modern Synthesis in Psychology: Nativism and Empiricism Together

The result of the debate that has continued for more than a century between empiricist and nativist theories of development is the emergence of a tacitly shared model—a kind of modern synthesis in psychology—that is neither strictly empiricist nor strictly nativist but simply Cartesian in its assumptions. The emerging model is an amalgam of a sort of logical empiricism with a version of maturationism. According to this view, infants are supplied innately with core knowledge systems that provide them with *predetermined* representations of certain aspects of the world such as numerosity and object permanence (Carey & Spelke, 1996; Hauser, Chomsky, & Fitch, 2002; Spelke, 2000). However, these initial representations must be extended by learning processes. Learning processes typically are characterized through a logical analysis of perceptual-motor input leading to inductions and generalizations growing from core knowledge. Debate continues about whether core knowledge systems change qualitatively over time or simply remain in place into adulthood, which mechanisms lead from innate representations to new forms of knowledge, and what roles perceptual analysis and learning mechanisms play in such changes. Yet the framework of the debate remains firmly grounded in Cartesian assumptions.

With respect to the origins and development of knowledge, the debate between empiricism and nativism—and the emerging modern synthesis—starts with a core set of shared dualist assumptions: The mind is isolated from its environmental context, thought is divided from action, and the way the mind is organized (psychological structure) is separated from the way it operates in the world (cognitive function).

Early empiricists tried to explain the origins of knowledge in sensory impressions of the environment with little reference to the role of the active person and mind. In classic empiricist theories, the role of organization in the mind is minimal (a "blank slate" in the extreme), and it is shaped by environmental contingencies. Links or associations between ideas are generated by whatever happens to co-occur: A person sees red and apple at the same time, so she or he remembers red-apple. In the behaviorist version of associationism, the mind is reduced to almost no role at all, and behavior is organized directly by environmental contingencies through the stimulus-response bond (Skinner, 1969). Contemporary empiricist theories tend to rely on an information processing metaphor in which sensory information from the environment is parsed by perceptual analysis into basic knowledge units that can then be recombined into higher level knowledge (Newell & Simon, 1971). However, common to all empiricist theories of mental development is a dualist separation of

mind from environmental context, a concomitant reification of the mind as a container or mechanistic processor, and a dualist separation of mental structure from mental content.

Information processing theories, in the empiricist tradition, have focused on the input and storage of information, building the analysis of cognitive structure on a model of information flow in a computer. These theories came late to the problem of where cognitive structures come from and how they change over time. A few information processing theories have posited qualitative hierarchies of cognitive structures (Anderson et al., 2004; Klahr & Wallace, 1976; Pascual-Leone, 1970), but they have provided only sketchy accounts of the origins of these structures and the mechanisms of transition from one structure to another.

Despite years of vociferous debate with empiricists, nativists share this set of dualist assumptions but privilege them in different ways (Fischer & Bullock, 1984; Overton, Chapter 2, this *Handbook,* this volume). Nativists and the closely associated rationalists also start from an acceptance of mind-environment, mind-body, and thought-action dualisms. The difference with empiricists is that the structure of the mind is primary instead of the structure of the environment. Nativists accept the dualism of inner structure and outer sensory information, but they simply assign them different roles. Instead of filling up preexisting mental containers with experience, the nativist role for sensory information is to provide inputs, which trigger the emergence or activation of preexisting psychological structures such as the syntax of language or the properties of objects. The dualist separation of psychological structure from its contextual relations with human activity has led to the reification of psychological structure and the inevitable conclusion that the structure must be innate. The outside world provides grist for the cognitive mill, or sometimes a triggering stimulus to kick off a new level of maturation, but plays a minimal role in the development of the psychological structures themselves.

When a dynamic system is approached statically, the complex relations by which it is organized and by which it develops are lost. The inescapable fact that it is *organized* is abstracted and reified as static form. When psychological structure is conceived as static form, with no activity and no inter-systemic relations to explain its origin and development, it appears to have an existence of its own, separate from the reality from which it is abstracted. Therefore, psychological structure must be innate, according to this argument.

The reification of dynamic structure as static form in the Cartesian tradition has earlier roots in Western culture (Pepper, 1942) extending back at least to Plato (1941) 2,000 years ago. His doctrine of ideal, universal forms provides a particularly clear example of how concepts and ideas are seen as independent of the mind. These forms exist independently of the imperfect material world, which evolves toward them. They are transferred to each newborn infant, who gradually remembers them with maturity. In the eighteenth century, Kant (1958) argued that we inherit preexisting cognitive structures or categorical imperatives, which determine how we make sense of our experience. In recent times, Chomsky (1965) and Fodor (1983) have argued for predetermined linguistic structures called *modules* that impose specific patterns on our learning of languages and concepts. Following Chomsky's lead, contemporary neo-nativists have posited innate structures determining such developmental achievements as number concept, object concept, and Euclidian geometry (Baillargeon, 1987; Fodor, 1983; Spelke, 1988).

Because both the empiricist and the nativist versions of the Cartesian tradition share the same dualist, static conception of psychological structure, neither has really challenged the other on the *nature* of psychological structure. However, the debate over how much emphasis to place on innate structures versus learning has forced each side to examine, rethink, and revise its theories. As theorists on both sides of the empiricist-nativist debate have attempted to revise their models to meet these challenges they have naturally turned to models within their shared Cartesian framework, and thus have increasingly adopted elements of each other's theories. While still emphasizing the importance of perceptual input, empiricism-based theories have come to rely on nativist conceptions about the origins of psychological structure to help explain how that input gets organized and how its organization changes over time. On the nativist side, theorists have increasingly come to depend on various functional-learning and perceptual-analysis mechanisms to explain how innate structures can lead to knowledge and conceptual change.

At first glance, bringing together two opposing tendencies into a more integrated model may seem like progress toward a more comprehensive theory. The resulting amalgamated model, however, does not take us beyond the Cartesian framework of dualism and therefore does not offer a way beyond the static conceptions of psychological structure—a way to explain how structure emerges from the interrelated activity of people

with their world and each other. For this reason, the Cartesian synthesis is not any more successful in explaining the broad data of variability in cognitive development. Linking static conceptions of psychological structure to mechanistic information processing models does not provide us with better explanations for variability in cognitive performance than either tradition did on its own. Understanding why Cartesian models—whether empiricist, nativist, or a combination of the two—have trouble explaining variability requires considering in more depth the static conceptions of psychological structure inherent in this tradition and the explanatory limitations they carry with them. This analysis lays the foundation for understanding how dynamic structuralism provides a path to analyzing the dynamics of structure in development starting from activities in context.

The Structure-as-Form Paradigm

Because the Cartesian tradition has been the dominant framework for scientific theories in general and psychological theories in particular, reductionism and reification have been the rule rather than the exception in conceptions of psychological structure. The prominence of these modes of thought in the Western intellectual tradition has encouraged the confounding of dynamic structure with static form. Accordingly, the structure-as-form model has tended to serve as an unconscious foundational metaphor (Lakoff & Johnson, 1999; Pepper, 1942) or paradigm (Kuhn, 1970) for scientific accounts of the organizational properties of natural and social systems, especially in psychology (Overton, Chapter 2; Valsiner, Chapter 4, this *Handbook,* this volume).

It is no easy matter to move beyond the static metaphors for structure, which language and cultural practices strongly support and which people typically use unaware. A dramatic, pervasive example is the conduit metaphor for communication (Lakoff & Johnson, 1980; Reddy, 1979). In ordinary discourse about communication of knowledge, people use this metaphor, talking as if the mind is a container for knowledge and as if things that they know are discrete objects. They treat communication as the transfer of knowledge objects from one person to another, as if static objects are being sent through a conduit such as a pipe or telephone line. This metaphor often leads to the belief that telling someone an item of information (giving them an object) is sufficient to communicate it and even to teach it. If a course or a chapter covers a concept, for example, then the student or reader is assumed to have been given that object. If they fail to demonstrate the knowledge specified by that object, they are taken to be ineffective learners (stupid, inattentive, or lazy). Research shows that students do not learn effectively from such presentations, but they require experience with acting on and manipulating the material to understand it (Crouch, Fagen, Callan, & Mazur, 2004; Schwartz, 2000; Schwartz & Fischer, 2005). This static metaphor (and others as well) omits the constructive nature of learning, knowing, and understanding from the assumed structure of communication and education, and their social nature is minimized too.

The conceptualization of structure as form treats structure as a static property of knowing that can be separated from the knowing activities themselves, just as the conduit metaphor separates objects of knowledge from activities of knowing. Imagine trying to remove the structure from the Golden Gate Bridge, gather it up somehow, and ship it off to someone else, who would add it to a pile of steel, which would quickly arise to form a replica of the San Francisco landmark. Even more absurd would be trying to extract the structure from the tightly coordinated, self-organizing, physicochemical processes of a living cell and then to apply it to a blob of inert chemical components in hope of generating a new cell. Structure is an inseparable quality of real dynamic systems, and it emerges as they develop (are constructed). In reality, structure cannot be separated from its role as the organizational property of dynamic systems.

In the study of development, three static conceptions of psychological structure have predominated, all of which have used static forms to explain dynamic structures. In many developmental theories, including Piaget's (1983, 1985) stage theory, activities take the form of abstract logical structures. In many linguistic and cognitive theories, activities take the form of preformed quasi-logical rules, typified by Chomsky's (1957, 1995) theory of innate linguistic competences and its corollary theories of innate cognitive competences (Baillargeon, 1987; Fodor, 1983; Spelke, 1988). In many traditional empiricist theories in Anglo-American psychology, activities take the form of linear input-output rules, as typified by linear models in statistics, information processing, and behavior genetics (Anderson et al., 2004; Horn & Hofer, 1992; Plomin, DeFries, McClearn, & Rutter, 1997). This linear form of theory is especially prominent in approaches that focus on domain speci-

ficity, the separation of knowledge into distinct parts tied to domains of experience.

Despite well-publicized disagreements among these three frameworks, they derive their core assumptions from the structure-as-form paradigm, portraying psychological structure in abstract forms existing separately from real self-organizing human activities. In stage theory, psychological structure is seen as a universal abstract logic imposing itself on the developmental trajectories of every person. Although Piaget believed that activity is the basis of knowledge and development, the base metaphor for his stage theory of cognition is successive stages of logic that determine specific cognitive performances across contexts and domains of knowledge and are relatively unaffected by the contexts of those performances. Similarly, nativist competence theories project a universal preformed code, blueprint, or set of instructions that somehow exists separately from the activities that it will someday engender. Like Platonic forms, these blueprints lurk among the genes, awaiting the right moment to impose order on behavior.

The experimental/psychometric framework also bases its core assumptions on structure as form, but there the structure is hidden behind standard methods and paradigms for explanation. The assumed linear combinatorial structures of dichotomies—person and environment, input and output, heredity and experience, domain x versus domain y—are embedded in research designs, statistical techniques, and theoretical concepts, but their implicit assumptions about structure are seldom acknowledged (Bronfenbrenner, 1979; Fischer & Bullock, 1984; Gottlieb, Wahlsten, & Lickliter, Chapter 5; Overton, Chapter 2; Thelen, & Smith, Chapter 6; Valsiner, Chapter 4, this *Handbook,* this volume; Wahlsten, 1990; Wittgenstein, 1953). Person and environment are partitioned into separate groups of factors instead of being treated as dynamic collaborators in producing activities. Much of modern biology has assumed similar reductionist, reifying notions of structure as form (Goodwin, 1994; Gottlieb, 2001; Kauffman, 1996).

The dominance of the structure-as-form paradigm in cognitive developmental theory has forced scholars to choose among these three inadequate notions of structure—stages, innate structures, and linear information processes. Instead, structure needs to be conceived dynamically. Psychological structure exists as a real organizational property of dynamic systems, just as the structure of the human skeletal system and the human circulatory system are real and distinguish humans from other animals. The structure is a property of the self-organizing systems that create it—the dynamic organization exhibited by self-organizing systems of mental and physical activity, not a free-floating ghost of competence or logic that dictates behavior to its human machine. Before we explicate concepts and methods of dynamic structure, however, we need to ground our argument with analysis of key problems with the static conceptions of structure that pervade developmental and psychological science.

The Stage Debate and the Discovery of Variability in Cognitive Development

The strength of the stage structure concept, as with all structure-as-form models, is its account of stability in development. Skills exhibit patterns of stability both in the ways they function and the ways they develop. What would account for such stable patterns in the functioning and development of cognition? Piaget's (1983, 1985) conception of formal logical stages addressed this question with what seemed to be a powerful and reasonable explanation: Individuals construct logical structures that preserve the organization of their interpretive or behavioral activities to be applied again at later times or in different situations. The existence of these structures accounts for the ability to apply the same concept or skill across many situations. Similarly, the emergence of concepts in specific sequences is accounted for by the fact that the logical structures underlying the concepts are constructed gradually, so that a partially complete logic would give rise to one concept (e.g., one-to-one correspondence) and the later completion of the logical structure would give rise to a more extensive and logically complete concept (e.g., conservation of number). Piagetian stage theory places all human cognitive activities into a sequence of abstract logical forms, but it has proved incapable of explaining the vast array of deviations from stage predictions (Bidell & Fischer, 1992; Flavell, 1971; Gelman & Baillargeon, 1983).

However, the strength of the stage structure concept was also its greatest weakness: Whereas universal logical structures accounted elegantly for stability, they offered hardly any explanation for variability in the functioning and development of cognition. Because the stage concept equated psychological structure (the organization of dynamic mental activity) with static form (formal logic), it provided no model of the real psychological mechanisms that might lead to variability and change in development. The idea of a fixed logical structure underlying all of a

child's conceptions at a given stage seems to explain observed consistencies in the form of children's thinking, but it predicts much, much more consistency than children show, and it has proven incapable of explaining departures from the predicted consistency.

Departures from the consistency predicted by stage theory proved to be more the norm than the exception as proliferating replication studies introduced a myriad of variations on Piaget's original tasks and procedures. On the one hand, opponents of Piaget's theory, doubting the reality or usefulness of formal stage structures, focused their research on identifying conditions in which stage theory predictions failed. In contrast, supporters of Piaget's constructivist view tried to validate the purported products of development—stage sequences, timing of cognitive achievements, and universality. These researchers focused a great deal of attention on demonstrating conditions in which stage predictions were empirically supported. Today, many researchers still continue along these independent paths, mostly ignoring or dismissing findings of people from the other camp.

The outcome of this protracted and often heated empirical debate has been the discovery of remarkable variability in every aspect of cognitive development studied. As researchers implemented variations in the nature of task materials, complexity of tasks, procedures, degree of modeling, degree of training, and methods of scoring across a multitude of replication studies, a consistent pattern of variation emerged (Bidell & Fischer, 1992; Case, 1991b; Fischer, 1980b; Halford, 1989; Lourenço & Machado, 1996). To the extent that studies closely approximated the assessment conditions used by Piaget, the findings were similar to those he had reported. When tasks and procedures varied greatly from Piaget's, the findings also varied greatly within certain limits.

A classic example of this pattern of variation is found in research on number conservation. In Piaget's theory, number conservation (the ability to conceptually maintain the equality of two sets even when one set is transformed to look much larger than the other) was seen as a product of an underlying stage of concrete operational logic. In the original number conservation studies, Piaget and Szeminska (1952) had used sets of 8 or 10 objects each and had identified 6 to 7 years as the typical age of acquisition for this concept. In one group of replication studies, Gelman (1972) showed that the age of acquisition for number conservation could be pushed downward from Piaget's norms if the task complexity was simplified by (a) reducing the size of the sets children had to compare and (b) eliminating the requirement for verbal justification of conservation judgments. Under these conditions, Gelman reported that children as young as 3 to 4 years of age could answer conservation questions correctly. Fortunately, the debate about number eventually produced important new discoveries spelling out developmental pathways for the early construction of number actions and concepts (Case et al., 1996; Dehaene, 1997; Spelke, in press).

As replication studies proliferated, this seesaw debate over age of acquisition of logical concepts was extended to other dimensions of psychological structure where researchers produced similar patterns of variability as a function of assessment conditions. These included variability in the three central characteristics we have described (developmental level, synchrony in level across domains or contexts, and sequence of development in a domain or context).

The growing empirical documentation of variability in development posed severe problems for the concept of formal stage structures. If concepts such as conservation of number are supported by underlying logical structures, then why wouldn't the logical structure manifest itself in most if not all situations? Why would a child show logical thinking one moment and in the next moment, appear to have lost it? If cognitive development consists of the emergence of successive forms of underlying logic, why wouldn't developmental sequences remain the same across domains, contexts, and cultures? The formal concept of stage structure could offer no specific explanation for this pattern of variability, but only the label of decalage.

In one sense, victory in the stage debate went to the skeptical. By the mid-1980s, the inability to account for the dramatic departures from stage theory's predictions of cross-domain, cross-individual, and cross-cultural consistency had resulted in a general flight from stage theory as an explanatory framework (Beilin, 1983). In a more important sense, however, there was no winner because neither side had offered a workable explanation of the patterns of variation the debate uncovered. What concept of psychological structure would explain the fact that cognitive performance varies so greatly with changing conditions and yet also exhibits great consistency under other conditions?

Explaining Variability versus Explaining It Away

From the perspective of the history of science, one might think that the discovery of new patterns of variability would be met with excitement and theoretical ad-

vance. After all, a central task of science is to discover and account for variability. Theories are constructed and reconstructed to interpret the range of variation observed and to search for patterns of order within this range. Indeed, an essential criterion of sound scientific theories is that they account for the full range of variability observed in a phenomenon of interest.

However, change in scientific theories is rarely that simple. Evidence that threatens a prevailing worldview or paradigm can lead to attempts to assimilate the discrepant findings into the current paradigm, either by denying their relevance or by advancing alternative explanations within the dominant paradigm (Hanson, 1961; Kuhn, 1970). Responses to the discovery of variability in development have followed this pattern, returning to the prevailing Cartesian framework and building minor modifications to account for portions of the observed variability. Instead of attempting to fully describe the range of variability and explain the reasons for the observed patterns, responses have tried to explain away variability through a variety of theoretical maneuvers that include ignoring variability, accepting variability without explaining it, and focusing on selected effects of variability to support existing theory with minor adaptations. Each of these theoretical responses to variability has served to preserve some version of the Cartesian framework and the structure-as-form paradigm in the face of the new evidence and has led to the modern Cartesian synthesis, despite the fact that most of the evidence of variability remains unexplained.

Reasserting Stage Theory

Piaget, Kohlberg (1969), and other stage theorists at first mostly ignored variability, treating it basically as a nuisance or as error of measurement. Differences across domains, tasks, contexts, and coparticipants in phenomena such as age of acquisition, synchrony, and developmental sequence were said to represent varying forms of resistance to the operation of underlying logical structures. Although Piaget later acknowledged the inadequacy of this position and experimented with alternative logic frameworks (Piaget, 1985, 1987; Piaget & Garcia, 1991), he never found an alternative concept of structure that would predict and explain when and how performance varies. (The discovery of the scale of hierarchical skill levels, shown in Figure 7.3, came from analyzing patterns of variation in growth curves, demonstrating the usefulness of analyzing variation for understanding stages.)

Several scholars have emphasized Piaget's belief in the importance of *decalage* and other forms of variation (Beilin, 1983; Chapman, 1988; Lourenço & Machado, 1996), but recognizing that phenomena need to be explained is not the same as explaining them. Piaget and other stage theorists have not specified the processes by which cognitive stage structures and environmental resistance interact to make one kind of task develop later than another in general. They have dealt even less adequately with variations across individuals in the order and timing of acquisition of skills and variations within an individual related to tasks, context, social support, and experience. In short, stage theory has provided no explanation for most observed patterns of variation in developmental level, synchrony, and sequence (Bidell & Fischer, 1992; Edelstein & Case, 1993).

Domain Specificity Theory

As evidence of variability grew and the inadequacy of the classic stage concept became clear, the theoretical crisis deepened. With stage theory losing its potential to generate interesting and credible research and with no clear alternative model of psychological structure available except for Chomskian nativism, some framework was needed as a basis for the continued empirical study of development. *Domain specificity* theory emerged as a way of freeing the field from its dependence on stage theory without demanding a new commitment to any particular model of psychological structure. According to domain specificity theory, psychological processes are not organized in universal structures, but within limited domains such as spatial, linguistic, or mathematical reasoning, or for groups of similar tasks such as problem solving, analogical reasoning tasks, and theory of mind (Demetriou, Christou, Spanoudis, Platsidou, 2002; Hirschfeld & Gelman, 1994; Turiel & Davidson, 1986; Wellman, 1990). The structures in these domains are often referred to as modules, indicating separate, distinctive structures of brain and behavior (Fodor, 1983). In education, domain specificity became a major theme through the influence of Howard Gardner's (1983) theory of "multiple intelligences," leading to curricular revisions in schools around the world.

Description of development and learning within important domains has great value for both developmental science and education, but many scholars have stopped with the domain description. They thus avoid having to explain patterns of variability—for example, the differences and similarities in age of acquisition across

different logical concepts such as number and theory of mind. Instead, they simply assert that cognition is organized locally and so cross-domain relations do not have to be explained. This theoretical stance simply acknowledges the fact of variability and sidesteps a systematic account of its origins.

In some ways, this acknowledgment has represented an advance for a field once dominated by stage theory with its assumption of a single logic that catalyzes change across all aspects of the mind. However, to the extent that domain specificity creates the illusion of having solved the problem of variation, it is an unfortunate theoretical detour. Developmental scientists need to explain why clusters of many (structurally equivalent) concepts emerge in different domains around the same time, showing interval synchrony (Case, 1991b; Fischer & Silvern, 1985). They need to explain how an individual who is working within a single domain and task exhibits one skill level when working alone, but a distinctly higher level when working with the support of a helpful adult (Fischer, Bullock, et al., 1993; Rogoff, 1990). Although domain specificity theory provides important recognition of developmental variability, it offers no explanation of variability across domains and within individuals.

Neo-Nativism

An important response to the evidence of variability has been the neo-nativist movement (Carey & Gelman, 1991; Fodor, 1983; Spelke, 1988), which represents a major theoretical alternative to stage theory within the structure-as-form paradigm. Researchers taking this perspective have used ingenious experiments to uncover surprising capacities of infants and young children and have led to the creation of the modern Cartesian synthesis. With the rejection of the concept of structure as stages of formal logic, the other predominant concept of structure—innate formal rules—seems to be the only remaining alternative within the structure-as-form paradigm. Unfortunately, the concept of innate formal rules has the same fundamental limitation as its sister concept of formal logic: As a static conception of structure, it cannot adequately account for the variability that arises from dynamic human activity (Fischer & Bidell, 1991).

Neo-nativist researchers have focused on selected effects of cognitive variability that seem to support the existence of innate competences within prominent domains such as number, space, language, object properties, and theory of mind (Carey & Spelke, 1994). For the most part, they have not attempted to deal with the extensive variability found in performance. Indeed, the modern father of this movement, Noam Chomsky (1965, 1995), specifically rejects the evidence of variability in language, asserting that it is illusory and that all people "really" speak the same fundamental language. The Chomskian theory of linguistic competence accounts for human linguistic behavior on the basis of a set of innate rules, only a few of which have been specified. Despite almost 50 years of effort, nativism has been notoriously unable to account for either the variations of human languages (Chinese is different from English!) or the highly variable everyday communication skills that individuals develop in a language within and across diverse settings (Lakoff, 1987; Ninio & Snow, 1996; Slobin, 1997). Nevertheless, the nativist approach has had great appeal to many developmental scientists because of its important discoveries about children's early abilities.

The basic paradigm for neo-nativist research is to design tasks that drive ages of acquisition much lower than traditional Piagetian norms (Baillargeon, 1987; Spelke, 1988, in press). Nativist researchers introduced techniques for simplifying Piagetian task materials and procedures, requiring only minimal activity from a child or providing modeling, training, and other forms of support for more complex activity. They have shown great ingenuity in discovering capacities of young infants and children, demonstrating strong violations of Piaget's age norms for various logical concepts. Their neo-nativist argument is that cognitive structure must be innate because acquisition of certain concepts can be demonstrated at very young ages. However, this *argument from precocity* takes into account only half the evidence for variability—the downward half (Fischer & Bidell, 1991; Halford, 1989). It treats the earliest age as the "real" age for a concept's emergence, ignoring evidence of wide variations in age of acquisition both upward and downward.

A good example of the focus on early age instead of variation is the extensive research on infants' acquisition of knowledge of objects, especially object permanence (objects continue to exist even when they have been displaced and are not perceived) and object tracking. Researchers have used the procedure of dishabituation, which is designed to assess preferences for stimuli without requiring much behavior. Infants are shown a stimulus until they are used to it (habituated), and then they are shown an altered stimulus. If they show increased attention to the new stimulus (dishabituation), the conclusion drawn is that they have noticed the difference.

A well-known case is Baillargeon's research on object permanence in young infants (Baillargeon, 1987, 1999). To appreciate the problems with focusing on only selective aspects of variability, it is useful to place this study in the context of Piaget's (1954) original findings and interpretations regarding infant object permanence. Piaget described a six-stage sequence in infants' construction of object permanence, which subsequent research confirmed with some revision and clarification (McCall, Eichorn, & Hogarty, 1977; Uzgiris & Hunt, 1987).

Piaget offered a constructivist interpretation of his observations: a simple activity-based mechanism to explain transitions from one stage to another. By *coordinating* early sensorimotor activities on objects to form new, more comprehensive action systems, infants gradually construct more inclusive understandings of what they can do with objects and therefore how objects can behave. For instance, by coordinating the sensorimotor actions for looking at and grasping objects at Stage 2, infants of about 5 to 6 months of age move to a new Stage 3 structure for dealing with objects—visually guided reaching, in which they simultaneously hold and observe an object. Piaget described an especially important transition at stage 4, when infants of about 8 months coordinate different visually guided reaching skills into a system for searching out objects that have been displaced or hidden. For instance, infants coordinate two skills (what Piaget called "schemes"): reaching for a rattle to grasp it, and reaching for a cloth that is covering the rattle to remove it. With this stage 4 coordination, they can begin to understand how objects come to be hidden by other objects and why hidden objects remain available to be retrieved. Later stages in this understanding extend to late in the second year of life, when infants become able to search exhaustively for hidden objects in many possible hiding places.

In contrast to Piaget's model of gradual construction of object permanence, Baillargeon focused on the lower end of the age range and a simple looking task. Infants from 3 to 5 months of age were habituated to the sight of a small door that rotated upward from a flat position in front of them, tracing a 180% arc away from them to lie flat again on a solid surface. They were then shown two scenes with objects inserted behind the rotating door. In the possible event, the door swung up but stopped at the object. In the impossible event, the object was surreptitiously removed and the door was seen to swing right through the space the object had occupied, as if it moved through the object. Infants as young as 3½ to 4½ months dishabituated to the impossible event significantly more than they did to the possible, and Baillargeon took this behavior as evidence of object permanence. She concluded that infants acquire object permanence 4 to 5 months earlier than the age of 8 months that Piaget had reported.

This argument from precocity is straightforward: If behaviors associated with a conceptlike object permanence can be found much earlier than in prior research, then the concept in question must be present innately. Similar evidence has led to claims of innate determination for a growing list of concepts, including object properties, space, number, and theory of mind (Carey & Gelman, 1991; Saxe, Carey, & Kanwisher, 2004; Spelke, 2000). Based on the static Cartesian model, these claims have important limitations centered on the failure to consider the full range of variability involved in developmental phenomena.

The crux of the problem is a simplification that ignores the gradual epigenetic construction of activities that vary in complexity. Baillargeon's task and procedure were dramatically different from the more complex method of assessment used by Piaget. In place of independent problem solving in which the infant must actively search for an object hidden in several successive places, Baillargeon substituted a simple look toward one of two displays. This procedure simplifies the task so greatly that it shifts from a conceptual task to one of perceptual anticipation. Indeed, on a computer a neural-network model of the situation can solve a similar task with a simple visual strategy and no coordination of object characteristics with spatial location (Mareschal, Plunkett, & Harris, 1999).

Baillargeon and other nativists claim that the object concept appears very early, even though the more complex behaviors described by Piaget still develop at the usual later ages, as shown by overwhelming evidence. The selective focus on one early age for one behavior obscures the constructive mechanisms of development and makes it seem that the concept of object permanence has suddenly leaped up, fully formed, at 3½ months of age. Within this framework, innate concepts emerge abruptly in the first few months of life, and development disappears. How could such early development arise except through innate concepts? The answer to this question is another question: How do skills develop through a long sequence of increasingly complex

object-related activities of which the looking behavior is only the beginning?

Competence/Performance Models

Nativists and many other cognitive scientists answer by distinguishing between competence and performance. The modern version of the competence/performance distinction was proposed by Chomsky (1965) in an effort to explain why his theory of innate linguistic rules could not predict the wide range of variability observed in actual language usage. Chomsky argued that innate language rules existed separately from the performance of specific acts of communication. The rules governed which communication practices are possible but not which ones will actually take place in a given situation. Many developmental scientists, faced with the similar problem of explaining why formal Piagetian conceptions of logic do not predict observed patterns of variability in cognitive performance, adopted this distinction (Flavell & Wohlwill, 1969; Gelman, 1978; Klahr & Wallace, 1976; Overton & Newman, 1982).

Competence/performance theories based on the Piagetian and Chomskian models portray cognitive structures as fixed rule sets in the mind/brain that specify behaviors but are somehow impervious to or independent of the contexts of the behaviors. The structures exist somewhere in the background and serve a limiting function: They determine the upper limit on the range of actions possible at a given time, but they leave open the specific action that will take place. For example, in arithmetic, the counting behavior of a preschool child arises from a mathematical competence such as being able to directly perceive numbers of objects of 1, 2, or 3. When a child fails to count, say, three pretzels accurately, the failure is explained by some interference such as memory failure or distraction (Greeno, Riley, & Gelman, 1984; Spelke, in press). A skilled person can indeed mess up a performance here and there because of memory failure or distraction, but when the 3-year-old fails almost all tasks for counting three objects, what sense does such an explanation make?

These models dismiss variability in cognitive and language performance by asserting that fixed competence is differentially expressed because of intervening cognitive processes (vaguely specified) or as a result of unanalyzed environmental resistance to the competence, as Piaget suggested for decalage. Although most nativist theories assume such a framework, some competence/performance theories do not require that psychological structures exist innately, but only that they are firmly separated from the actions that instantiate them. The dynamics of construction of activities leading to wide variation are lost in the muddy mediators that somehow prevent competence from being realized in activity. Such conceptions of disembodied structure seem not too distant from the humorous idea of bottling up the structure of the Golden Gate Bridge. Why is it necessary to posit separate levels of structure, existing somewhere (it is unclear where) outside the real activity in question? Why not model the organization of the actual mental and physical activity as it exists in its everyday contexts?

In short, domain specificity, nativist, and competence/performance models share the same fatal limitations as the logical stage models they were meant to replace. Although the newer models do not make the cross-domain claims that stage models did, they retain a conception of psychological structure as static form existing separately from the behavior it organizes. Whether such static forms are seen as universal logics or domain-specific modules, they offer accounts only of stability in the organization of behavior while ignoring or marginalizing variability. The challenge for contemporary developmental science is not to explain away evidence of variability in performance. Instead, scholars need to build dynamic models of psychological structure, using concepts such as skill, hierarchical complexity, contextual support, and developmental web to build methods for analyzing and explaining both the variability and the stability in the organization of dynamic human activity.

The Constructivist Alternative

The constructivist alternative takes as its starting point what the Cartesian framework rules out: the constructive agency of a human being acting in the context of relationships among systems—biological, psychological, and sociocultural. As we have shown in the opening sections of this chapter, the dynamic structural framework provides a straightforward, comprehensive alternative to the conundrums created by the Cartesian synthesis and the related structure-as-form paradigm. Human knowledge is neither passively received from the environment nor passively received from the genome. Instead, people construct knowledge through the active coordination of action systems beginning with the earli-

est sensorimotor activities of newborns, influenced by environmental and genetic systems. By coordinating the systems of activity (including perceptual activities) through which they participate in the social and physical worlds, infants create new relations among these systems and thus new potentials for acting in and understanding the world. These new relations among action systems constitute psychological structures—the organizational aspect of human knowledge, which we refer to as skills. They exhibit both wide variations and patterns of order within the variations.

Dynamic systems research provides the framework for this alternative account, drawing on traditions that have developed outside of or as an alternative to the Cartesian tradition. Important concepts and methods come from epistemological constructivism and related sociocultural/sociohistorical theory (Cole, 1992; Rogoff, 2003), traditional systems theory (Dixon & Lerner, 1992; von Bertalanffy, 1976), dynamic systems theory (Thelen & Smith, 1994; Chapter 6, this *Handbook,* this volume; van der Maas & Molenaar, 1992; van Geert, 1991), and the developmental science group (Cairns, Elder, & Costello, 1996; Cairns, Chapter 3; Valsiner, Chapter 4, this *Handbook,* this volume). These traditions, while differing in many ways, share a constructivist focus on action, interrelatedness, and complexity of psychological, biological, and sociocultural systems. From this perspective, the person is the primary agent of cognitive change, constructing new kinds of relations among psychological systems with biological and cultural systems (Bidell & Fischer, 1996; R. Kitchener, 1986). These relations are organized in particular ways that give rise to specific patterns of performance, and they are complex and variable because they are living systems.

People construct the skills of human understanding and action through their diverse bodies, the variable physical world, different sociocultural relations, and distinct developmental histories, thus producing highly variable activities. If this variability is ignored, it acts as noise disguising the nature of developmental processes and thus misleading researchers and educators. However, if the tools of developmental analysis are used to control and manipulate conditions contributing to variability, then the systematicity of the variability can be uncovered and it becomes a key to understanding the nature of psychological structure. In the next section, we discuss some of the methodological tools by which developmental variability can be used to understand and describe the development of dynamic psychological structure.

METHODOLOGY OF DYNAMIC STRUCTURAL ANALYSIS

To overcome the limitations of structure as static form, we need to articulate a framework for dynamic development, which includes a set of methods that embody dynamic concepts. Classical research methods use static notions, indicating the age when a competence emerges (really, the mean or modal age for one context and one group), forcing growth into linear models, and partitioning analysis of activities into dichotomies such as heredity and environment or input and output (Anderson et al., 2004; Horn & Hofer, 1992; Plomin et al., 1997; Wahlsten, 1990). Most importantly, effective research needs to be designed so that it can detect variability and, in turn, use the variability to uncover sources of order or regularity in development.

Effective research should be built with designs, measures, analytic methods, and models that can detect variations in growth patterns. Research must be designed to deal with variability, or it is doomed to fail to provide an adequate analysis of development. This chapter focuses on activities in which people coordinate and differentiate lower-order components to form higher-order control systems, which encompasses most activities of interest to developmental and educational researchers. The components of these control systems range from neural networks to parts of the body, immediate contexts (including objects and other people), and sociocultural frameworks for action. Moment by moment, people construct and modify control systems, and the context and goal of the moment have dramatic effects on the nature and complexity of the systems. Frequently, people do the construction jointly with others. To go beyond static stereotyping of development and learning, research must deal directly with these facts of variation. Research must be designed to deal with the wide range of shapes of development that occur for different characteristics of action and thought in diverse contexts and conditions.

Developmental regularities can be found at several levels of analysis, from brain activities to simple actions, complex activities, and collaborations in dyads or larger groups. In analyzing these developmental regularities, it

is important to avoid a common mistake. No one regularity applies to all characteristics of developing activity or all levels of analysis. The same developmental regularities will not be found everywhere. That is an essential principle of the variability of human activity.

In one major realization of this principle, development has many different shapes! Some behaviors and brain characteristics show continuous growth, others show clusters of spurts and drops, still others show oscillation, and some show growth followed by decay (Fischer & Kennedy, 1997; Siegler, Chapter 11, this *Handbook,* Volume 2; Tabor & Kendler, 1981; Thatcher, 1994; Thelen & Smith, Chapter 6, this *Handbook,* this volume; van Geert, 1998). Ages of development likewise vary dynamically, even for the same child measured in the same domain: Assessment condition, task, emotional state, and many other factors cause ages to vary dramatically. There are no legitimate *developmental milestones,* stones fixed in the developmental roadway in one position. Instead, there are *developmental buoys,* moving within a range of locations affected dynamically by various supports and currents.

It is remarkable how pervasively researchers ignore or even deny variations in shape and age of development. Scholars committed to a continuous view of development typically ignore the spurts and drops in many developmental functions, insisting that development is smooth and continuous despite major evidence to the contrary. Physical and psychological development are both routinely graphed with smooth curves, as in the charts in a pediatrician's office, even though research on individual growth consistently shows patterns of fits and starts in virtually all aspects of physical growth (Lampl & Johnson, 1998). The distortion is just as pervasive in psychological development. For example, Diamond's (1985) findings of linear growth of memory for hidden objects in infancy are frequently cited, even though replications by others with the same tasks and measures show nonlinear, S-shaped growth (Bell & Fox, 1992, 1994). Many data sets show powerfully nonlinear individual growth as the norm in infant cognitive and emotional development as well as development at later ages (Fischer & Hogan, 1989; McCall, Eichorn, & Hogarty, 1977; Reznick & Goldfield, 1992; Ruhland & van Geert, 1998; Shultz, 2003).

In a similar manner, at the other pole of argument, scholars committed to stage theory often ignore the evidence for continuous growth, even in their own data. For example, Colby, Kohlberg, Gibbs, and Lieberman (1983) asserted that their longitudinal data on moral development showed stages in growth even in the face of clear evidence that growth was gradual and continuous (Fischer, 1983). In the same way for age, scholars routinely talk as if there are developmental milestones at specific ages, despite the massive evidence of variability in age of development with variations in conditions of assessment (Baron-Cohen, 1995; Case, 1985; Spelke, in press). Common claims, for example, are that object permanence develops at 8 months in Piagetian assessments, conservation at 7 years, and combinatorial reasoning at 12 years, although no such statement is tenable without more specification because the ages vary greatly with task, support, and so on. Classic research on reflexes in very young infants even demonstrates variability in the ages at which they emerge and disappear (Touwen, 1976).

Starting in the Middle of Things: Implications for Design

To study development *in medias res*—in the middle of things—research designs need to be broadened so that they capture the range of variation and diversity of human activities in real-life settings. If development is assessed with an instrument that places all behavior on a single linear scale, for example, then nothing but that linear change can be detected. The limitations of most classical research arise from assumptions that restrict observation and theory to one-dimensional analysis. When those assumptions are changed, research opens up to encompass the full range of human activity. By limiting developmental observation and explanation to one-dimensional processes, the static assumptions have stymied investigation of the richly textured dynamic variations of development. To do research that facilitates multidimensional-process explanation requires building research designs that go beyond one-dimensional assumptions to provide for detection of the dynamics of variability (Edelstein & Case, 1993; G. Gottlieb, Wahlsten, & Lickliter, Chapter 5, this *Handbook,* this volume; Lerner, 2002; Thelen & Smith, 1994, Chapter 6; Valsiner, Chapter 4, this *Handbook,* this volume; van Geert & van Dijk, 2002).

Here are four important one-dimensional assumptions that are typically incorrect and that are embodied in research designs that implicitly assume static structure. These all need to be avoided in designs for assessing the dynamics of change by addressing variability and diversity.

1. *Single-level, single-competence assumption—not.* At any one moment, a person functions at a single cognitive stage or a single level of complexity and possesses a single competence. Contrary to this one-level, one-pathway assumption, people function at multiple developmental levels concurrently, even within the same situation (Fischer & Ayoub, 1994; Goldin-Meadow & Alibali, 2002; Siegler, Chapter 11, this *Handbook,* Volume 2). In development, a person moves through a web of connected pathways composed of multiple strands (domains or tasks), each involving variation within a range or zone of developmental levels, as illustrated in the webs in Figures 7.2 and 7.9. Assessments must include multiple pathways and multiple conditions so that the full range of levels and competences can be detected.
2. *Single-shape assumption—not.* Each developmental pathway shows essentially similar linear or monotonic shapes. Contrary to this linearity assumption, developmental pathways or strands take many different shapes, which frequently include reversals in direction—not only increases but also decreases, as illustrated in Figure 7.11. Individual people normally grow in fits and starts both physically and psychologically, as we described in the introduction to this section. In development, these fits and starts seem to be especially prevalent and systematic when people are functioning at optimum or when they are building a new skill in microdevelopment. Developmental pathways or strands for individual activities move through nonlinear dynamic patterns of change, seldom showing straight lines. In long-term development, there are periodic movements to a lower level (regressions), especially after developmental spurts (Fischer & Kennedy, 1997). In microdevelopment, backward movement to a low-level skill is common before construction of a new skill (Granott & Parziale, 2002), as we discuss in the section on Microdevelopment.
3. *Single-person assumption—not.* People develop and learn individually, and they sometimes interact and affect each other. Contrary to this individualist assumption, people do not usually function solo, but instead from birth they act in a fundamentally social way, working together in ensembles that distribute a task across several collaborating partners (Bronfenbrenner & Morris, Chapter 14, this *Handbook,* this volume; A. Brown & Palincsar, 1989; Scardamalia & Bereiter, 1999; Vygotsky, 1978). Studying development socially is not only more realistic, but it can also make the processes of development more transparent. When people work together, communicating about what they are doing, the internal processes of learning and thinking become externalized, and the processes of social collaboration and interference become evident (Fischer & Granott, 1995).
4. *Single context assumption—not.* The most effective research typically focuses on one task and variations on it or one context for assessment. Contrary to this uniformity assumption, research needs to combine multiple tasks and assessment contexts so that it can capture the range of levels and competences, pathways, and social interactions that characterize development (Bronfenbrenner, 1993; Campbell & Stanley, 1963; Fischer, Knight, et al., 1993). To accurately describe people's developing activities, research must be designed with an array of assessment conditions and an array of tasks within conditions.

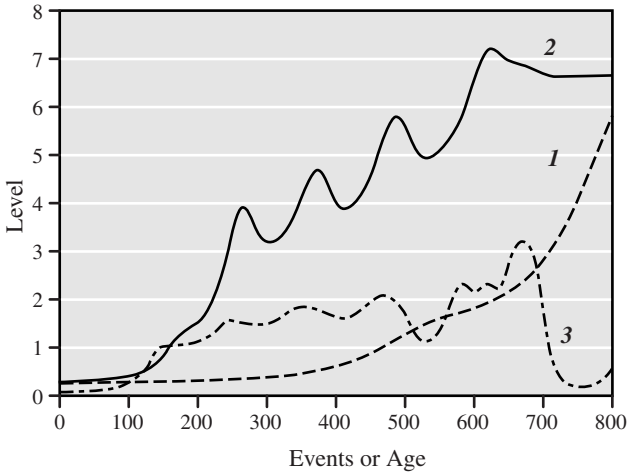


Figure 7.11 Three different growth curves based on the same growth model. The growth curves are all generated by the same nonlinear hierarchical model of development of self-in-relationships used in this chapter, but variations in the values of the parameters in the equations produce vastly different shapes. The same growth processes produce essentially monotonic growth (Grower 1), growth with stagelike spurts and drops (Grower 2), and fluctuating change (Grower 3).

Guidelines for Developmental Research

To analyze and understand natural variations in development as well as consistencies across variations, research needs to move beyond these limiting assumptions. Analyzing the dynamics of change requires

methods that allow detection of variations in development and learning:

- People develop along multiple concurrent pathways in a web.
- From moment to moment people function across a range of different levels and competences.
- People develop in the long run and learn in short time periods according to diverse shapes of growth, including the complex nonlinear fits and starts in many growth curves.
- People learn and develop in social ensembles, and research should reflect this fundamentally social nature of development.
- People act differently in different tasks and conditions, and so research needs to include a range of tasks and conditions to detect the full range of variability in action and thought.

Only through analyzing the natural variability in development and learning can researchers come to understand the consistencies inside the variation.

Putting together all these contributions to variation can seem daunting, but it need not be. A few straightforward guidelines in designing research and analyzing observations facilitate uncovering the variation and diversity of development. Investigators should focus on (a) using well-designed clocks and rulers to measure change and variation, (b) studying several tasks and domains to determine the generality and variation in pathways, (c) varying assessment conditions to uncover the range of variability in level and content, and (d) investigating diverse sociocultural contexts to discover the effects of different cultural groups on development. No one study can investigate all sources of variation at once, but investigators can make sure that several sources are evaluated in each study. Also researchers need to situate their findings within a conceptual map of the multiple sources of dynamic development, avoiding the pitfall of reductionist description, which assumes that one study captures the important sources of variation.

Clocks, Rulers, and Repeated Measures

Detection of variation in developmental shapes requires both good clocks and good rulers to measure change. To capture either smooth growth or fits and starts requires a clock that can detect the speed of change. Ages or events need to be sampled frequently enough to provide several assessments for each period of increase and decrease. Otherwise, the shape of growth cannot be detected. Also, the distribution of ages or times of assessment must be chosen carefully so that estimates of changes in item or response distributions are not distorted by biases in time sampling. Much developmental research uses clustered ages such as groups of 2- and 4-year-olds clustered tightly around the mean ages of 2 and 4. This design assumes the importance of mean differences and provides a bad clock for development, because it represents only a few of the many points along the time scale from 2 to 4 years. If major reorganizations of activity are hypothesized to occur, for example, every 6 months in the early preschool years as Case (1985) predicted, then assessments must take place at least every 2 or 3 months to reliably detect the periods of reorganization, and the distribution of ages across 2- or 3-month intervals should be uniform, not clustered at the mean age.

Capturing the shapes of development requires a good ruler as well, one that provides a scale sensitive enough to detect the ups and downs of growth. The best assessments provide a relatively continuous developmental scale of increasing complexity, such as the Uzgiris and Hunt (1987) scales to assess infant development and the scales for nice and mean social interaction (Ayoub & Fischer, in press; Fischer, Hencke, & Hand, 1994). It is crucial to avoid scales that combine items in a way that forces growth into a particular function, as when intelligence tests force test data into scales that show linear increase with age.

A single task seldom makes a good ruler because it provides such a limited sample of behavior. Better is a series of tasks or a grouping of tasks that forms coherent developmental scales. A series of tasks can be used to assess either (a) a Guttman-type developmental scale measuring one linear pathway in a developmental web (Guttman, 1944), like the Uzgiris-Hunt scales, or (b) branching pathways like the tasks for nice and mean interactions and those for reading single words in Figures 7.5 and 7.10. Through analysis of profiles across tasks, a good ruler can be created for either pathway. A particularly useful method is Rasch scaling, which is based on a sensible, nonlinear (logistic) developmental model and allows detection of Guttman scales as well as branches (Bond & Fox, 2001; Dawson, 2003; Rasch, 1980). The discovery of the general ruler for hierarchical skill development came from research assessing performance profiles with these and related methods, as

discussed in the section titled A Common Ruler for Skill Development.

Table 7.2 shows a set of profiles for defining the simplest developmental pathway in the development of reading words—Figure 7.10 (a), the pathway for normal readers, which includes only one simple branch (Knight & Fischer, 1992). The sequence is determined by the ordering patterns for every pair of tasks. For most profiles in this simple sequence, every task is passed up to a certain point in the table from left to right, and then all tasks are failed thereafter, which is characteristic of a Guttman scale. Branching is indicated by profiles that show variations in this simple pattern, such as Step 2b in Table 7.2, where there is a failed task in the middle of a string of passes. Based on analysis of performance across tasks for each word, a child is assigned a profile in Table 7.2, and therefore a step in the pathway, even when assessment is at a single time rather than longitudinal. The table shows pass/fail tasks for simplicity, but multistep scales can be used, with scaling tested by tasks earlier in a sequence having higher scores than those later.

Profile analysis can detect webs as simple as the one for normal readers in Figure 7.10 (a), or as complex as the one for nice and mean social interactions in Figure 7.5. The logic of analysis is the same for branched webs as for linear Guttman scales, and sequencing is determined by the ordering patterns of all pairs of tasks. Indeed, the same set of tasks can define different webs for different children. For example, different sets of profiles for the tasks in Table 7.2 define the unintegrated webs for poor readers in Figure 7.10 (b) and (c), such as the web in which the three domains of identifying letters, reading words, and rhyming words are all independent.

An important characteristic to keep in mind when devising tasks to build rulers for change is the similarities and differences among tasks. Simple ordering like that in Table 7.2 is typically eliminated by differences in content or procedure between tasks. When researchers have attempted to build scales using distinctive tasks to assess different steps, the task differences have wiped out scaling of steps (Kofsky, 1966; Wohlwill & Lowe, 1962). A good, simple Guttman-type ruler uses tasks that include only variations in complexity or difficulty, with minimal differences in content and procedure. Differences between distinctive tasks are captured by having separate Guttman rulers for each set of tasks (each domain). In a similar way, measuring the temperature of a refrigerator in New York requires a different thermometer from measuring the temperature of the surface of Mars. Rasch analysis can also facilitate using a common scale across tasks and domains (Bond & Fox, 2001; Dawson et al., 2003), as it has helped test the generality of the ruler for skill complexity, showing simultaneously the *same scale* across domains and large domain effects.

Another method for devising a ruler uses groupings of similar tasks to assess a scale. For example, in early language development, Ruhland and van Geert (1998) grouped words into syntactical classes based on Dutch children's spontaneous speech to form a sensitive developmental scale. With pronouns, for example, they found a large growth spurt late in the second year, as shown in Figure 7.12. Other groupings that have proved useful in studies of development have included arithmetic problems of similar complexity (Fischer, Pipp, & Bullock, 1984) and explications of dilemmas about the bases of knowledge called reflective judgment (K. Kitchener et al., 1993). Scales based on such groupings of similar tasks can be used to specify the shapes of development in various domains and to compare relations among development across domains or levels in individual subjects or groups. Like scalogram analysis, they also provide a way of testing developmental functions with

TABLE 7.2 Task Profiles for Normative Developmental Sequence for Reading Words

Step	Word Definition	Letter Identification	Rhyme Recognition	Reading Recognition	Rhyme Production	Reading Production
0	–	–	–	–	–	–
1	+	–	–	–	–	–
2a	+	+	–	–	–	–
2b	+	–	+	–	–	–
3	+	+	+	–	–	–
4	+	+	+	+	–	–
5	+	+	+	+	+	–
6	+	+	+	+	+	+

Note: Pass = +; Fail = –.

Adapted from "Learning to Read Words: Individual Differences in Developmental Sequences," by C. C. Knight and K. W. Fischer, 1992, *Journal of Applied Developmental Psychology, 13,* pp. 377–404.

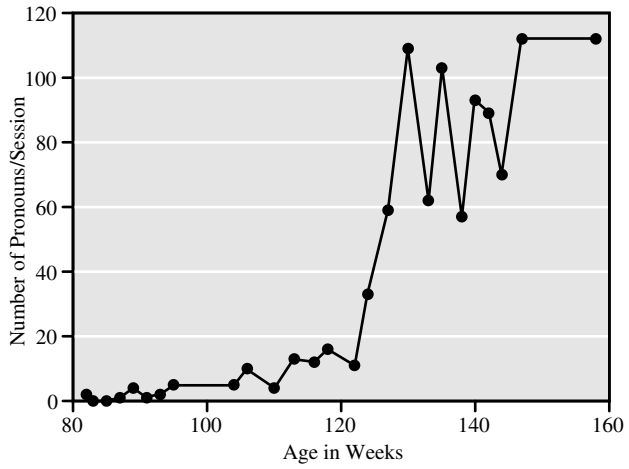


Figure 7.12 Development of pronoun use in the Dutch boy Tomas. *Source:* From "Jumping into Syntax: Transitions in the Development of Closed Class Words," by R. Ruhland and P. van Geert, 1998, *British Journal of Developmental Psychology, 16*(Pt. 1), pp. 65–95.

cross-sectional designs. For example, this method can test for both spurts and bimodal distributions on emergence of developmental levels or growth of separate strategies for approaching a task (Siegler, 2002). The design must included separate groups of tasks for each level or strategy. The grouping method, however, does not provide a sensitive index of the intervals in a scale between points of discontinuity, or levels.

Rasch analysis fills this need, providing powerful tools for assessing the steps and intervals along a scale as well as discontinuities (Bond & Fox, 2001; Rasch, 1980). Only recently have researchers begun to realize its potential for assessing developmental scales and determining the distances between items along a scale. Most investigators have used it to determine whether items in a domain fit a single Guttman scale and what the distances are between items along that scale, and it can also be used to assess for several independent scales or branches in a web. Rasch scaling provides one of the most convincing sources of evidence for the scale for hierarchical complexity of skills shown in Figure 7.3 (Dawson, 2003; Dawson et al., 2003).

The three techniques for combining tasks to form developmental scales (Guttman scaling, groupings of similar tasks, and Rasch analysis) provide a repeated-measures assessment that has many of the desirable characteristics of longitudinal assessment, even when there is only a single session. Through analysis of task profiles and distributions, each person can be tested to determine whether he or she follows a particular developmental pathway or growth function. Contrary to the conventional wisdom that development can only be effectively assessed longitudinally over months and years, these repeated-measures assessments can provide powerful tools for describing and testing developmental pathways and growth functions. They can also be combined with longitudinal designs, where they provide even more powerful tools for assessing development.

General Structure across Tasks in a Domain

Task differences are typically controlled for and systematically manipulated in developmental scales. However, task differences are important in their own right. Task is one of the most powerful sources of variability in behavior, as documented by thousands of psychometric and experimental studies across many decades (Fleishman, 1975; Mischel, 1968). An accurate portrait of development requires assessment of different tasks and domains to capture patterns of variation in developmental pathways and growth functions.

One of the most common hypotheses in cognitive and developmental science is that behavior divides into domains, which are built on general psychological structures. That is the core of the domain specificity framework and of neo-nativist explanations. However, evidence for generality in a conceptual structure is relatively rare in the research literature, where careful tests of generalization are infrequent (Fischer & Immordino-Yang, 2002). Many abilities that have been described as general competences seem not to be coherent abilities at all but instead summary variables, with at best weak correlations among items. Examples include the hypothesized domains of theory of mind, metamemory, visual thinking, and ego resiliency, for each of which there is no clear evidence of a central generalized structure that generates common activity across a wide array of tasks. For example, ego resiliency has been posited as a broad characteristic of effective people and it has been subjected to extensive longitudinal study by Jack and Jeanne Block (Block, 1993). Research on this general competence in Dutch and American children indicates that ego resiliency does not affect relevant specific competences such as school achievement and social preference (Harter, 1999; van Aken, 1992). That is, it does not show a generalizing relation with specific skills, which would indicate a common structure applied across tasks. Ego resiliency may be a useful social construct, but it does not seem to be a central psychological structure that organizes various activities together in development.

One convincing case of a general structure in a domain is the central conceptual structure documented by Robbie Case and his colleagues (1996). It provides a model for defining a general structure and testing its generality. Assessment of the development of a general concept of number requires an array of tasks that all require the use of that concept. Case and his colleagues have constructed such a task array for the elementary number line, which represents number as quantitative variation along a line. This representation constitutes what they call a *central conceptual structure* for number in young children, a framework for thinking about number that facilitates numerical understanding across many situations. Tasks like reading the time on a clock, counting gifts at a birthday party, and doing simple arithmetic problems in school all make use of this same structure. Discovery of general conceptual structures like the number line would be a strong boon for educators, greatly streamlining their efforts to teach children the basic concepts and skills required by modern society.

From approximately 4 to 8 years of age, children build the central conceptual structure for number. When instructors and curriculum explicitly teach the structure, children evidence a major improvement in performance across a wide array of number tasks but not for tasks in other domains such as understanding social interactions. The change amounts to as much as 50% of the variance in test scores, which is a remarkably large effect. The use of many tasks allowed Case and his colleagues to determine how general the structure is—where children apply it and where they do not. Note also that along with the general change across number tasks, the researchers still found large task effects and considerable developmental variation in level. The generality of the structure operates within this substantial variability.

In the behavioral sciences, researchers commonly wish to generalize from their data to the development of a domain, but the two standard methods preclude legitimate generalization by artificially reducing variation instead of analyzing it. First, in the "psychometric method," commonly used in intelligence, education, and personality testing, many tasks are summed and only the summary scores are considered. A boy's IQ score is 116, or the college entrance test score for a young woman is 575. Most of the variation in each person's performances on the tasks is ignored. Second, in the "experimental method," commonly used in experimental psychology and neuroscience, a researcher analyzes one task by varying a parameter and calculating mean performance differences for specific values of the parameter. Variations in performance in the task other than the means are treated as error variance and not analyzed further. Also, variations among diverse tasks are ignored because only one task is examined.

The psychometric strategy is evident in ability theories, where researchers study some hypothesized general ability such as spatial intelligence or verbal intelligence (Demetriou et al., 2002; Sternberg, Lautrey, & Lubart, 2003). The evidence for the coherence of these supposedly modular abilities is modest in comparison to Case's evidence for a central conceptual structure for number. Most tasks or items that measure each ability or intelligence have only minimal variance in common, with correlations between pairs of items typically accounting for approximately 4% of the variance (an average correlation of .2 between individual items).

Educational researchers have regularly thrown up their hands in dismay that they have found so little generalization or transfer of concepts to tasks that are distinct from those taught (Salomon & Perkins, 1989). For example, when instructors teach a concept such as gravity, evolution, or working memory, they commonly find that even intelligent students have difficulty using the concept in tasks different from those explicitly taught in class. The reason for the difficulty of this far generalization (use of knowledge in tasks far from the original object of learning) is that the construction of generalized skills requires time and effort (Fischer & Immordino-Yang, 2002). Furthermore, even with a strong conceptual structure like Case's number line, generalization is not perfect. For a weak structure such as spatial intelligence or ego resiliency, generalization should not be expected. Learning is not a simple transmission of information through a conduit from one person to another or from one task to another.

Researchers using the second strategy, experimental manipulation of a task, typically restrict their investigations to one task and variations of it. Their intent is to control for extraneous sources of variability, such as task effects, but at the same time, they wish to generalize about broad abilities or concepts such as object permanence (Baillargeon, 1999), the concept of number (Spelke, in press), or working memory (Diamond, 1985). Unfortunately, the cost of restriction to a single task (or even two) is an absence of generalizability of results beyond that task.

When researchers use different tasks to assess a domain, they typically find very different portraits of development for each task. Indeed, many of the central

debates in the study of development center on issues of task difference. When do children really understand object permanence? When do children control the syntax of their native language? When can people think logically? Such questions cannot be answered without examination of many distinct tasks that index the domain of interest. Analysis of the dynamics of variability then becomes possible.

Multiple Assessment Conditions and Social Support: Developmental Range

Even for a single task, a person typically shows vastly different competence with variation in social-contextual support, as demonstrated by the developmental range. Other powerful sources of variation for an individual person in a single task include emotional state, coparticipant, and familiarity with the task and situation. To capture these sources of variation, research should include multiple conditions designed to evoke different levels of performance in each person. It is not legitimate to ignore these variations and claim broad application of a developmental analysis based on one assessment task and condition.

Recall the study of Korean adolescents' conceptions of self-in-relationships, which documented the power of variation in developmental range—the contrast between conditions of unassisted performance (low support) and priming of a task (high support; Fischer & Kennedy, 1997; Kennedy, 1991). The upper limit on individual performance under these two conditions changes powerfully, as shown in Figure 7.8. The gap is robust and cannot be removed by simply increasing training, practice, or motivation. The developmental range illustrated in Figure 7.1 documents this robustness for another domain—nice and mean stories. Performance on these stories shifted repeatedly up to optimal level with high support and down to functional level with low support, and the gap did not lessen with practice, instruction, and motivational manipulations (Fischer, Bullock, et al., 1993).

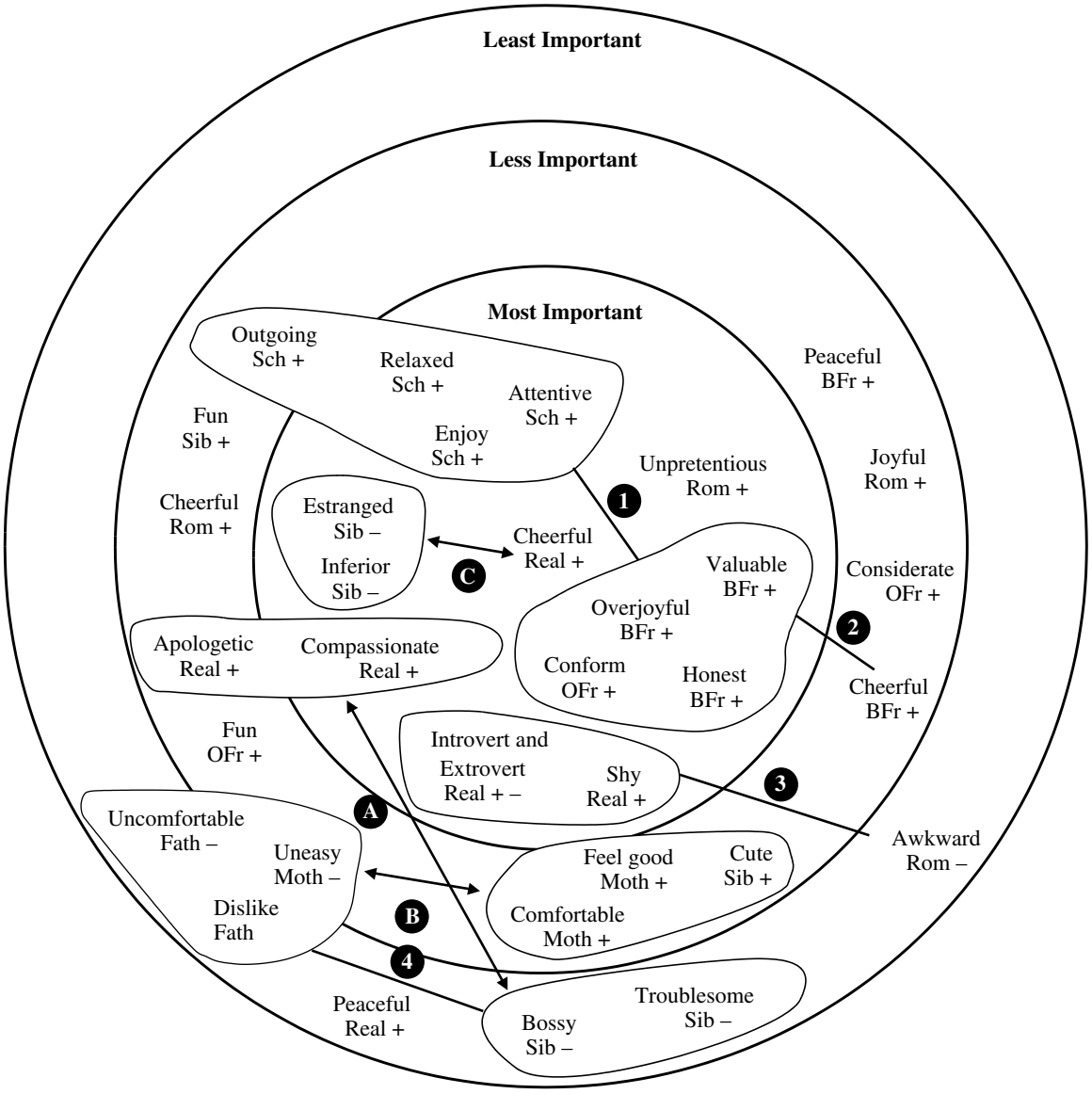
For a high-support procedure to produce optimal-level performance, it must be designed to sustain appropriate performance and minimize interference. Tasks should be straightforward and well defined, procedures should be familiar to participants, and there should be no incompatible emotional state. Most important, the context should prime high-level functioning, with social priming by a more knowledgeable person often proving especially effective. Successful priming procedures have included demonstrating a task and asking people to imitate it, explaining the gist of a task, and providing a prototype of an effective solution.

The Self-in-Relationships (SiR) Interview illustrates an effective, flexible high-support procedure. Participants built their own tool for priming themselves—a visual representation of themselves in relationships. In addition, an interviewer asked structured questions to prime high-level functioning. First, participants were asked to describe several characteristics of themselves in relation to each of a series of designated people (listed in Figure 7.13). They wrote each description on a Post-It paper and indicated whether it was positive, negative, or of mixed valence. Then they arranged the descriptions on an 18-inch circular self-diagram, placing each self-description within one of three concentric circles that ranged from most important (inner circle) to least important (outer circle). Each student grouped descriptions together on the diagram and indicated relations between groups or individual descriptions. Once the diagram was created, the interviewer asked specific questions to assess four distinct developmental levels from the skill scale. For example, the level of abstract mapping of self-understanding was assessed by asking each student to explain the relation (mapping) of two salient abstract self-descriptions to each other, such as attentive and overjoyful in Figure 7.13.

The SiR was designed to assess functional as well as optimal levels of self-understanding. The low-support condition was given at the start of a session and assessed a person's functional level through the traditional "spontaneous" procedure (McGuire & McGuire, 1982). Without any diagram or supportive questions, participants were asked first to describe what they were like with each of the designated people, to indicate whether any characteristics seemed to go together, and to note those that were opposites. Then they moved on to the high-support condition.

Scholars have often claimed that the collectivist nature of Far Eastern cultures leads people to have no clear self-concept, in contrast to people in the West (Fischer, Wang, Kennedy, & Cheng, 1998; Markus & Kitayama, 1991). Research with traditional Western low-support assessments has seemed to show that the self-descriptions of people in Far Eastern countries are indeed primitive and simple, and that there is little developmental change in concepts of self during adolescence.

This claim illustrates the limitations of one-condition assessments, which ignore the effects of contextual sup-



BFr: Best Friend
Fath: Father
Moth: Mother
OFr: Other Friend
Real: Real Me
Rom: Romantic Friend
Sch: School
Sib: Sibling
A-C: Opposite
1-4: Similar
+: Positive
–: Negative
+ –: Positive and Negative

Figure 7.13 Self-in-relationships diagram constructed by a 15-year-old Korean girl.

port on the variability of levels of self-complexity. Because Eastern cultures typically discourage a focus on self in conversation, people are likely to show low levels of self-description unless they are given strong social-contextual support for describing themselves. That explains why the difference between optimal and functional levels was so dramatic in the Korean study (see Figure 7.8). Under low-support conditions, Korean adolescents did indeed show simple, primitive self-descriptions, which they presumably also show in much of their public conversation. High-support conditions, on the other hand, produced complex self-descriptions, comparable in

developmental level to those of U.S. adolescents, although emerging about a year later. The gap between optimal and functional levels appears to be larger in Korean youths than in their U.S. counterparts, probably because of the Korean devaluation of focusing on self.

Sociocultural Variation and Frames of Meaning

A powerful source of variability in developmental pathways is sociocultural context, as reflected by differences across nations, ethnic and racial groups, and social classes (Cole, 1996; Rogoff, 2003; Valsiner, 2001; Whiting & Edwards, 1988). To capture the range of variation in human development, researchers need to assess developmental pathways in distinct cultural groups. Doing research in a different culture usually requires working with a native of that culture to ensure that the research engages the meaning systems of the culture instead of misrepresenting them.

One major dimension of disagreement in developmental science involves generalizing findings to all human beings versus emphasizing cultural differences. Dynamic structural analysis requires analyzing this source of variation instead of assuming either universality or cultural difference. Diverse social groups value different activities, teach different contents, prescribe different roles and norms, and practice different child-rearing practices. A method of raising children that is common in one culture (e.g., Western parents' placing their infants in a separate bedroom to sleep) may be more than unusual in other cultures (the Gusii of Kenya consider Western sleeping arrangements abusive; LeVine, Miller, & West, 1988).

Yet some characteristics turn out to be universal or at least common across many cultures, and others vary greatly (Fischer et al., 1998). The optimal skill levels in development of self-in-relationships, for example, look similar in China, South Korea, Taiwan, and the United States. Also, people tend to view themselves in predominantly positive terms across the same cultures, as is evident with the Korean girl in Figure 7.13 (note the distribution of pluses and minuses). On the other hand, the emotion of shame differs greatly across cultures. Fundamental in Chinese and many other Asian cultures, it develops early in children's speech, is highly differentiated with many different words for shame situations and reactions, and pervades adults' discourse and emotion concepts. That same emotion is treated as being much less important in the United States and Great Britain, where it develops late in children's speech and is minimized in the emotional concepts of most middle-class adults (Li, Wang, & Fischer, 2004; Shaver, Wu, & Schwartz, 1992).

Developmental researchers need to explain such similarities and differences by examining major sources of variation, such as task, assessment condition, emotional state, and culture. Then they need to characterize the variations effectively, relating their findings explicitly to concepts about development and variation. Traditionally, theories of development and learning have been replete with complex conceptions of change and variation processes, but there has been no way to test adequately the process claims, to determine whether the processes specified actually produce the growth patterns predicted. That deficit no longer exists.

Building and Testing Models of Growth and Development

Developmental theories require complex, sophisticated tools for analysis, going beyond the models of linear main effects that have dominated the behavioral sciences. Methods based on nonlinear dynamics, including both dynamic growth models and neural networks, provide powerful ways of representing and analyzing the dynamics of change. These dynamic methods mesh naturally with developmental theories to allow developmental scholars to begin to capture the complexities of human development (Fischer & Kennedy, 1997; Shultz, 2003; Thelen & Bates, 2003), and they can be easily programmed on computers with common software such as Excel.

With these new tools for building models of change, the claims of virtually any theory can be explicitly tested in what van Geert (1994) calls "experimental theoretical psychology." Developmental or learning processes can be represented in equations, and computers can be used to run experiments by varying parameters to test whether the growth functions that the models produce fit theorists' predictions and empirical findings. A model of growth defines a basic growth function or set of functions for each specified component, which is called a "grower." These growth models can simulate not only quantitative growth, such as complexity level, frequency of an activity, or preference but also qualitative developments such as emergence of a new stage, coordination of two strands into one, or splitting of a strand into branches.

One important kind of nonlinear dynamic model represents networks in the brain and nervous system. Re-

searchers have built many neural network models to depict and analyze processes of learning and adaptation that involve coordinating and differentiating activities at one or two levels of complexity (Bullock et al., 1993; Elman et al., 1996; Grossberg, 2000; van der Maas, Verschure, & Molenaar, 1990). For example, word inputs are compared to infer how to make a past tense verb in English. Visual scanning and object characteristics are integrated to infer how an infant looks for objects of a particular type following a specific path. Or visual input and arm-hand control are integrated to produce visually guided reaching.

An important characteristic for evaluating the models is whether they reflect the real architecture of the activities that they represent. Many models use global, generalized programs to analyze the development or learning of an activity. Although these generalized approaches make models easier to design, their structure typically does not closely match the architecture of the real activities. Models that have been constructed specifically to fit the real architecture of the behavior, social interaction, or nervous-system network being modeled have been more successful. For example, the adaptive resonance theory of neural networks has been used to construct models that carefully match the architecture of the nervous system, the body, and the senses (Raizada & Grossberg, 2003). A model of eye-hand coordination is based closely on how eye, hand, and related cortical networks are actually built (Bullock et al., 1993). Many models have paid much less attention to the specific architecture of the activity being modeled. A question to ask in evaluating a model is whether it plausibly reflects the architecture of the activity of interest.

Nonlinear Dynamic Models of Growth and Development

For decades, systems theory and nonlinear dynamics have been popular as broad theoretical interpretations of development (Sameroff, 1975; von Bertalanffy, 1976), but the tools needed for precise developmental analysis were missing. When the computer revolution began to produce a powerful array of new dynamic modeling tools, investigators began with models of a few tractable psychological problems, especially involving motor coordination (Bullock et al., 1993; Thelen & Smith, 1994). Now there is an explosion of dynamic systems research, including diverse models for analyzing activity and its development (e.g., Case et al., 1996; Fischer & Kennedy, 1997; Hartelman, van der Maas, & Molenaar, 1998; Shultz, 2003; van Geert, 1998). Our focus in this chapter is on models of hierarchical growth of action, thought, and emotion. We define basic growth processes for psychological growers and how they are connected in a developmental process.

An important consequence of these new tools is that they lead to more powerful and precise definitions of growth, development, and learning. Traditionally, these three terms for patterns of change have been defined restrictively in terms of directional change, usually, linear increase (Willett, Ayoub, & Robinson, 1991; Wohlwill, 1973). In dynamic structural analysis, they are defined instead by specific *models of change processes*—any systematic mechanism of change, resulting in not only linear increase and decrease but also complex patterns such as increase occurring in successive jumps and dips, or oscillation between limits. Equations specify these growth processes systematically and predict a family of growth curves, often of many different shapes. In common usage, *growth* is the most general term, *development* tends to be used for systematic increase over long time periods, and *learning* typically means short-term increase based on experience. We expect the meanings of the terms to be revised over time as a result of the more precise definitions of change in dynamic models. The most important point for our purposes is that growth, development, and learning are no longer identified by the shape of any one particular curve. There is no need for restrictive definitions such as monotonic increase.

Logistic Growth

The best starting point for growth models is usually logistic growth because most growth processes in biology show this kind of growth. Figure 7.14 shows three examples of logistic growth, all produced by the same basic equation, which generates the S-shaped curve that typifies much simple growth. Note that even this simplest curve is not linear. The model is called *logistic* because the equation includes log values (squares or higher powers of the grower's level).

Many basic growth processes involve this form of growth, where the change at a given time is derived from three parameters: (1) the prior level of the grower, (2) the growth rate of the system, and (3) a limit on the system's growth, called the *carrying capacity.* The term *level* refers to some quantity that a grower has reached, potentially involving a wide array of different characteristics such as developmental level, frequency of response, or amount of activity. In many of our

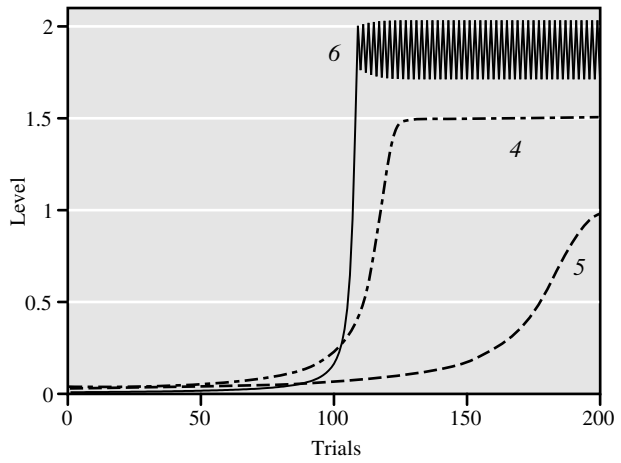


Figure 7.14 Three forms of simple logistic growth.

examples, level *(L)* refers to the complexity of an activity along the skill complexity scale in Figure 7.3, as applied to the development of self-in-relationships (Fischer & Kennedy, 1997). Models have also been built for other domains such as King and K. Kitchener's (1994) reflective judgment, which develops through seven stages that show growth curves similar to those for self-in-relationships (K. Kitchener & King, 1990; K. Kitchener et al., 1993).

By itself, without connection to other growers, the equation produces mostly S-shaped growth, as with Growers 4 and 5 in Figure 7.14. Even without connection, however, there is significant variation in the growth curve, as illustrated by the turbulence in Grower 6 as it nears its carrying capacity. The three growth curves in Figure 7.14 all derive from the same equation, and only values of the growth parameters differ.

Logistic growth equations can take several different forms, and van Geert (1994) recommends the following as the best starting point for modeling hierarchical growth for an action, thought, or emotion, designated as Grower B:

$$L_{B_{t+1}} = L_{B_t} + R_B \frac{L_{B_t}^2}{K_B^2} - R_B \frac{L_{B_t}^3}{K_B^3}$$

$L_{B_{t+1}}$ is the level of Grower B, with subscript t indicating the previous trial, and t+1 indicating the current trial. R_B is the rate of growth of B, specifying the amount of change that occurs in each trial. K_B is the carrying capacity of B, which is the limit on growth that is characteristic of this particular system in this situation.

The equation is divided into three terms, which together produce the level of B in the current trial. The first term is the level in the previous trial. Next is the growth term—the growth rate times the square of the level in the previous trial divided by the square of the carrying capacity. With modest growth rates, this factor produces an increase on each trial. Level is divided by carrying capacity to base growth on a *ratio* with the system's capacity instead of its absolute value, because of an assumption that the level operates as a function of the capacity.

The growth term in this logistic equation squares the ratio of level to carrying capacity, in contrast to a simpler form of the equation, which uses the ratio without squaring. The squared form of the equation seems to represent psychological growth processes more accurately, and that growth depends on the person's prior level in two simultaneous ways: (1) current understanding is built on earlier understanding, and (2) level affects the probability of encountering situations that promote growth. van Geert (1994) elaborates this argument and shows that this form of the growth equation fits individual growth curves better than the squared equation. The growth curve for pronoun use by the Dutch child Tomas in Figure 7.12 fits this version of the equation well, but not the nonsquared version (Fischer & Kennedy, 1997; Ruhland & van Geert, 1998).

The third term provides a form of regulation based on the limits of the system. Without some limit, the level will eventually explode to ever larger quantities. In real biological systems, there is always some limit, based on the availability of food, space, energy, and the like. The regulation term subtracts an amount to limit the system based on its carrying capacity and keeps it from exploding. The amount subtracted is the product of the growth term (the second term in the equation) multiplied by the ratio of the level to the carrying capacity. The result is the cubing of level, which leads to this equation being called the *cubic* logistic equation. (The simpler equation is called the *squared version.*) When the current level is low in relation to carrying capacity, little is subtracted; but when the current level rises, the amount subtracted becomes larger. As the level approaches the carrying capacity, the amount subtracted becomes large enough to cancel out growth, and thus the level approaches the carrying capacity as a limit. This growth process does not always produce smooth S-shaped growth, however. When the growth rate is high, the level can show turbulent fluctuations as the level approaches the carrying capacity, illustrated by Grower 6 in Figure 7.14. Note, in

Figure 7.12, that Tomas's development of pronoun use also evidenced this turbulence as his use grew rapidly to a high level. Turbulence is a common property of dynamic systems when they grow very rapidly.

Growth can be characterized with other kinds of equations, most obviously with differential calculus instead of the difference equations that we are using. Differential equations assume that feedback for change is instantaneous and continuous in time, whereas difference equations assume that feedback occurs between discrete events such as social encounters or learning situations. The assumption of discrete events seems appropriate for most psychological development and learning. Also, differential equations are mathematically complex and difficult to work with, whereas difference equations can be used easily in any computer spreadsheet program by using recurrent trials (similar to what is required for calculation of mortgage payments). van Geert (1994) provides step-by-step guidelines on how to use a spreadsheet program to build a dynamic model. Singer and Willett (2003) describe another class of growth models based on linear assumptions, and they also provide step-by-step guidelines for use.

Connections among Growers

Any single activity is affected by many different components and influences coming together. In a growth model, each component (grower) is represented by a growth function, and all growers can be connected within the set of growth functions. Modeling a grower starts with a growth function like the first equation, and connections are built around that function. The connections range from strong to weak to nonexistent, and the ways that they affect growth take many different forms. Connections between growers can involve aspects of the person acting alone, or they can be between people, as in a teacher-student relationship (van Geert, 1998).

Different combinations of components can produce different growth curves. With dynamic systems, however, even the same combinations can produce widely different growth functions. Shapes as diverse as monotonic growth, successive stagelike change, and chaotic fluctuation can all arise from the same set of equations. Growth curves 1, 2, and 3 in Figure 7.11 all arise from the same nonlinear hierarchical model of development of self-in-relationships for five relationships, each with five developmental levels (Fischer & Kennedy, 1997). Despite the great differences in their shapes, only the values of the parameters in the equations differ. The same growth processes produce virtually monotonic growth (Grower 1), growth with stage-like spurts and drops (Grower 2), and fluctuating change (Grower 3).

The strongest form of connection among growers is hierarchical integration, where each successive step within a strand in the developmental web builds on the previous step. In one example of such integration, two strands come together to form a new single strand such as when an adolescent girl compares herself in two relationships. The 15-year-old Korean girl represented by the diagram in Figure 7.13 compared what she was like at school (being attentive, enjoying school) with what she was like with her best friend (feeling valuable, being overjoyful). She built a mapping for those characteristics of the two relationships. The model of the strand for each relationship uses a skill scale of five hierarchical growers built successively on each other—Growers A, B, C, D, and E. A grower later in the sequence starts only after the level of the immediately prior grower, the prerequisite, has become sufficiently strong and frequent for a person to begin to build on it. When the girl coordinates her characteristics at school with those relating to her best friend, she is coordinating two strands, each with five hierarchical growers forming a five-level scale.

In this prerequisite connection, the prior grower must reach some specified level *P* before the later grower can begin to change:

$$L_{B_{t+1}} = L_{B_t} + P_{B_t}\left[R_B \frac{L^2_{B_t}}{K^2_B} - R_B \frac{L^3_{B_t}}{K^3_B}\right]$$

P_{B_t} is the *precursor function* for Grower B at time *t* based on the level of the prerequisite Grower A:

$$\text{If } L_{A_t} < p,\ P_{B_t} = 0;\ \text{If } L_{A_t} > p,\ P_{B_t} = 1$$

Before Grower A has reached its prerequisite level *p* at time *t,* such as .2, precursor P_B is 0, and Grower B does not grow. When Grower A reaches .2, precursor P_B becomes 1 and Grower B starts to grow. Specification of the precursor function can be more complex than simply one trial at .2. For example, Grower A might need to stay at .2 for some number of events or trials before Grower B starts to grow; or two different prerequisite Growers, A_1 and $A_{2,}$ might both have to reach a specified level.

In addition to strong hierarchical connections among growers, there are also weaker connections, both within and between strands. These weak connections can be difficult to detect at any one moment, but in growth models they often cumulate, either from repeated action over many occasions or from multiple connections working together at the same time. These weak connections then become powerful determinants of the shapes of growth.

One common kind of weak connection is competition, in which growth in one component or strand interferes with growth in another. For example, trying to relate two opposing characteristics of the self, such as feeling comfortable and feeling uneasy, may interfere with earlier understandings of the characteristics themselves. Another common connection is support, in which growth in one component or strand promotes growth in another. Understanding how the real me is shy can facilitate the girl's understanding of why she is awkward with a boyfriend (Rom for Romantic in Figure 7.13). Connections of competition and support occur both between successive growers (levels within a strand) and between domains (relationships or strands). We use within-strand between-level connections to illustrate the processes. Fuller explications are available from van Geert (1994) and Fischer and Kennedy (1997).

As grower C begins to grow along the strand, it competes with grower B, as with feeling comfortable and feeling uneasy. In this model, the competition process is the product of a competition parameter times the change in Grower C on two successive trials divided by the level of C on the prior trial. This term is subtracted from the growth equation for Grower B:

$$-Cb_{C\rightarrow B}\frac{L_{C_t}-L_{C_{t-1}}}{L_{C_t}}$$

where $Cb_{C\rightarrow B}$ is the parameter specifying the strength of the competitive effect of Grower C on Grower B. The competition parameter specifies the strength of the competition effect. Large values of parameters of competition and support can cause major perturbations in growth, including crashes and explosions. Ordinarily, the values are small, which reflect the weakness of these connections.

In this model, the competition is a function of the change in the level of Grower C relative to its prior level, not the level by itself. The rationale for this form of competition is that the amount of change involved in growth is posited as the major source of competition, not the absolute level of skill. For example, when an adolescent is working to construct an abstract mapping for comparing her feelings of being comfortable with her mother to her feelings of being uneasy, her new understanding is likely to disrupt her prior understandings temporarily until she can work on the understanding for a while. In addition, the time and effort she spends on building that understanding competes with further learning of her skill at the prior level because that time is used up. That is how Grower C competes with Grower B as a function of the change in level, not the absolute level itself.

Support of Grower B by Grower C in this model takes a different form—the product of a support parameter times the level of Grower C divided by the carrying capacity of C. This term is added to the growth equation for Grower B:

$$+Sb_{C\rightarrow B}\frac{L_{C_t}}{K_C}$$

where $Sb_{C\rightarrow B}$ is the parameter specifying the strength of the supportive effect of Grower C on Grower B. For example, when an adolescent relates the shyness of her "real me" with her awkwardness with a boyfriend, the relating of the two characteristics can facilitate the separate lower-level understandings of the shyness and the awkwardness. This support from higher growers turns out to be important in producing developmental spurts in growth curves. For many parameter values, it promotes the occurrence of growth patterns like the succession of spurts seen in Figures 7.7 and 7.11 and thus helps explain empirical findings of successive spurts in growth curves like that for the self-in-relationships study.

Addition of the between-level support and competition processes to the second equation provides this connected growth model for Grower B:

$$L_{B_{t+1}}=L_{B_t}+P_{B_t}\left[R_B\frac{L_{B_t}^2}{K_B^2}-R_B\frac{L_{B_t}^3}{K_B^3}+Sb_{C\rightarrow B}\frac{L_{C_t}}{K_C}-Cb_{C\rightarrow B}\frac{L_{C_t}-L_{C_{t-1}}}{L_{C_t}}\right]$$

Each successive level in the hierarchy involves a similar growth equation, and together the equations for the five levels constitute a growth model for one strand of self-in-relationships. The complete model includes five separate relationships (strands), each with connections of support and competition among them as well, and the between-

strand competition and support are defined differently from those within level (Fischer & Kennedy, 1997).

These various connections among growers have powerful dynamic effects on the shapes of growth and development. The confluence of multiple types of connections turns out to be important for determining the many shapes of development.

Equilibration, Disturbance, and the Shapes of Development

If the self-in-relationships model is correct, it should produce growth curves like those obtained in the self-in-relationships study for optimal and functional levels, as well as a number of other kinds of growth curves of interest to generate questions for further research. Processes such as equilibration, disturbance, regression, and turbulence can be explored with the model.

The empirical results for development of self-in-relationships in South Korea include a striking difference between optimal and functional levels, as shown in Figure 7.8, where the measure is the highest level obtained for the entire interview. Under optimal conditions, students showed relatively rapid growth as well as two successive spurts in understanding. Under functional conditions, they underwent very slow, monotonic growth.

The model produced growth patterns similar to the empirical ones, with analogous differences between the levels and shapes for high- and low-support assessments. Figure 7.15 presents growth curves generated by the model under high- and low-support conditions. Note that the contextual support referred to in high and low support is different from the support between growers in the model. Contextual support is not included directly in the model, but is varied through the parameter of growth rate. All parameter values for the curves in the figure are the same, except that high-support growers have a high rate and low-support growers have a low one. With differences in rate alone and no other differences among the equations, the shapes shift from strongly stagelike hierarchical growth to more mono-tonic and variable growth. All the high-support curves approximate the empirical curve for self-in-relationships under high support. The low-support curves for relationship 3, which has the slowest growth rate, approximates the empirical curve for low support. Included in the variability of some of the low-support curves is a jump or drop, which presumably represents likely growth patterns when the growth rate is a little higher than it was in the Korean sample. In general, low rates produce relatively monotonic growth, and high rates produce a series of discontinuities (spurts and drops).

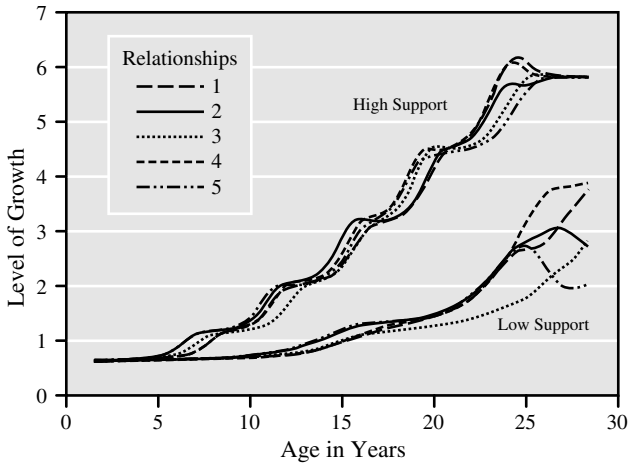


Figure 7.15 Growth model for development of self-in-relationships: Optimal and functional levels for five relationships and five hierarchical levels.

This change from growth through a series of discontinuities to growth that is variably monotonic defines a broad set of the growth patterns for the model, but the model also produces other patterns. For example, in Figure 7.11, which shows curves generated by the same model, Growers 1 and 2 represent similar variation from discontinuous to more monotonic growth. However, Grower 3 represents a more unstable pattern, which is common when the growth curves are less stable or equilibrated.

According to Piaget (1985) cognitive development is usually equilibrated—regulated to produce a series of successive equilibria (times of stability) marking the stages in his developmental hierarchy. Spurt-and-plateau growth patterns like those for high-support growers in Figure 7.15 show an equilibration process, in that the growers for different domains tend to seek the same levels—what is referred to as an *attractor* in nonlinear dynamics, because there seems to be something pulling the curves toward a common place. For example, when one grower moves higher than the others, which can be construed as a disturbance from equilibrium, it is pulled back toward the common level. At the same time, the growers for functional level do not show any clear attractor—no tendency to seek the same level.

This pattern is also called U-shaped growth because of the decrease after each spurt—which scholars have often puzzled about (Strauss, 1982). The U shape

is especially dramatic in Grower 2 in Figure 7.11. In these dynamic growth models and in empirical research on optimal levels, peaks of growth are often followed by drops. By experimenting with the full range of possible values of the parameters in the model, Fischer and Kennedy (1997) determined that the support among multiple domains (relationships) in the model caused this pattern through growers catalyzing each other's growth and thus producing an overshoot beyond the carrying capacity of the system. Such complex effects from connections among growers are one of the hallmarks of dynamic systems.

Orderly equilibration is a quality of one class of hierarchical growth curves, but there are many forms that show no such order. Besides curves like those for low support in Figure 7.5, many growth functions spread disturbances throughout a system of growers. Sometimes, these disturbances lead to growth patterns like the one shown in Figure 7.16, which we call the Piaget effect. When Piaget (1950) criticized efforts to speed up children's early development, he suggested that pushing them beyond their natural levels was like training animals to do circus tricks. Instead of contributing to their normal growth, it could lead to stunted long-term development like what happens in some circus animals. The model and growth parameters in Figure 7.16 are the same as those for optimal levels in Figure 7.15, except that Domain 2 was given a special one-time boost to its growth rate at the second level, analogous to special training to produce precocity. The boost caused Domain 2 to immediately grow to higher levels than the other domains, but over time the other domains grew more and

Figure 7.16 The Piaget effect: Disturbance of development caused by early speeding up of growth.

Domain 2 ended up at a much lower level. Also, the five domains stopped showing equilibration with each other and instead spread out across a wide range of levels. In this way, a short-term boost in one grower disturbed the entire system, changing the growth patterns of all the growers it was connected with.

The Piaget effect is still an orderly pattern. Sometimes, the growers in this and related hierarchical models show much wilder disturbances, including crashes, explosions, and turbulent vacillations, analogous to the turbulence produced by the simple logistic growth formula with Grower 6 in Figure 7.14. In this way the same growth processes produce a full range of shapes of development from monotonic growth to stagelike equilibrated growth to disturbed growth and turbulent variation. Some of the growth functions of these hierarchical growth patterns even seem to fit the properties of catastrophe and chaos (van Geert, 1994). These are truly nonlinear systems, and they provide a powerful tool for facilitating description and analysis of the many shapes of human development.

Van der Maas and Molenaar (1992) hypothesize that developmental reorganizations marked by shifts to a new skill level reflect an especially important property of change according to catastrophe theory—hysteresis, in which during a time of major change the point of jumping to a higher or lower level shifts depending on the direction of variation in a control parameter. For example, the temperature at which water freezes when heat is removed differs from the temperature at which ice melts when heat is added. Candidates for hysteresis effects in psychological development include contextual support and emotional state. With changes in these factors, shifts to higher or lower levels would vary more dramatically during a time of transition between levels than later when the level had been consolidated.

A wide array of nonlinear dynamic tools is available for tying down developmental processes and analyzing change, and much work remains to be done to apply them to analysis of development and learning. Many of them were devised in biology to deal with the ecology of species interactions and the dynamics of long-term evolution (Holland, 1992; Kauffman, 1996; Wolfram, 2002). A few scholars have even begun to apply nonlinear concepts to social phenomena such as how people work together to construct their own development (Fogel & Lyra, 1997; Nowak, Vallacher, Tesser, & Borkowski, 2000). A particularly promising area for advancing

methods and theories of development is the study of transition mechanisms in microdevelopment of both individuals and social ensembles.

BUILDING STRUCTURES: TRANSITION MECHANISMS, MICRODEVELOPMENT, AND NEW KNOWLEDGE

Because the study of development is the study of change, any adequate account of the development of psychological structures must provide credible explanations of the transition mechanisms by which a constructive agent develops from structures at a given level to more complex, inclusive, and differentiated structures. Recent advances in methods for task analysis in general and microdevelopmental analysis in particular have moved the field beyond the vague descriptions of transition mechanisms of the past. The outlines of a constructivist model of task- and context-specific developmental transitions are emerging. This methodology promises to provide answers to a key question that cognitive scientists have puzzled over: How do people construct new knowledge, building novel understanding out of existing skills (Granott et al., 2002; Gruber, 1973)?

The study of transition mechanisms is closely associated with the concept of microdevelopment (also called microgenesis). *Microdevelopment* is typically defined as the study of developmental change over short time periods, spanning minutes, hours, days, or weeks rather than months or years. Studying processes of change over short periods produces fine-grained data about the course of transitions as they occur (Granott & Parziale, 2002), which is not possible with the widely spaced observations of traditional cross-sectional and longitudinal developmental studies.

Relations between Micro- and Macrodevelopment

An important advantage of dynamic structural analysis is that it provides a way of relating short-term and long-term change. Past approaches have tended to take either long-term development or short-term microdevelopment (learning) as central, either reducing one type of change to the other or emphasizing one and neglecting or dismissing the other (Piaget, 1950; Skinner, 1969). They have been caught in the problematic unidimensional assumptions about developmental methods and concepts that we outlined earlier.

Microdevelopment is the set of short-term processes by which people construct new skills for participation in specific contexts, which Vygotsky (1978) called "proximal processes." Macrodevelopment describes the larger-scale processes in which many local constructive activities in different contexts and domains are gradually consolidated, generalized, and related to form the big, slow changes of development over long periods.

The image of the developmental web in Figure 7.9 illustrates this approach to micro- and macrodevelopment. The microdevelopmental processes by which specific skills are constructed in specific contexts are represented by the strands of the web shown under construction (dashed and dotted lines). At any given time, many strands are under construction, and the strands follow different developmental pathways for different contexts and with different coparticipants. The shifts from optimal to functional and from functional to scaffolding levels begin at different developmental points along the scale on each strand and span several levels in the developmental range for that strand, as shown in Figure 7.9 as well as Table 7.1 and Figures 7.1 and 7.8.

Stepping back a bit, scanning across the developmental web presents a broad picture of macrodevelopment. Whereas each small piece of each strand entails microdevelopment, the collection of processes involved in constructing the web as a whole constitutes macrodevelopment, which is not simply an atomistic heap of many microdevelopmental processes but the cumulative process in which all the micro processes participate. In this sense, micro and macro processes are intrinsically related and interdependent in a way that is analogous to the molecular and subatomic worlds. Neither can exist without the other, but neither can be reduced to the other. At the microdevelopmental level of analysis, we find some phenomena that do not appear at the macrolevel, and vice versa.

An important macrodevelopmental phenomenon is the clustering of discontinuities with developmental levels, the intervals in which jumps, drops, and reorganizations in skills co-occur across strands (domains), labeled "emergence zones" in Figure 7.17. This phenomenon captures the kernel of truth in stage theories—what allows people experienced with children to predict accurately, before they have ever met a child, most of the skills the child will be able to use. Examined up close (microdevelopmentally) the web shows enormous variability in performance, but examined from a distance, there is relative

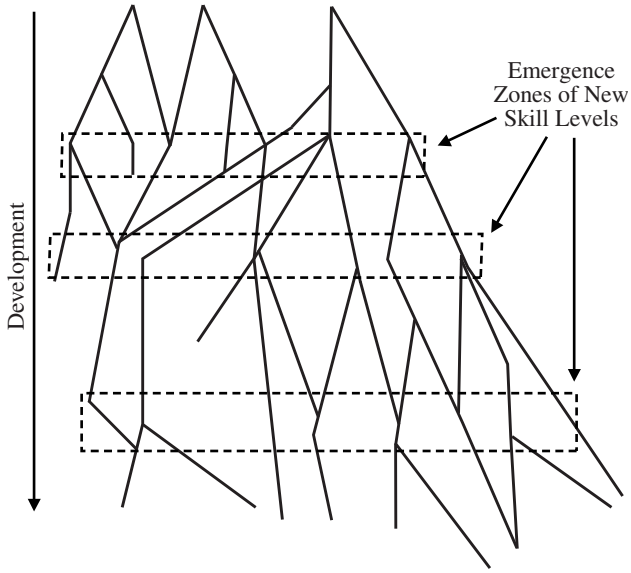


Figure 7.17 Developmental web with concurrent discontinuities across strands. The boxes show three zones of concurrent discontinuities. Additional zones occur earlier and later in the web.

consistency in emergence of a level. For example, understanding of self-in-relationships spurts in individual adolescents at approximately 15 to 16 and 19 to 20 years in macrodevelopment, but microdevelopmental analysis of changes over hours, days, and weeks shows each individual gradually constructing these new skills.

The clustering of discontinuities in macrodevelopment arises not from a mysterious underlying stage structure but from the dynamics by which people build skills through the integration of earlier components in a gradual process with constraints. The constraints include sociocultural meanings and settings (Rogoff, 2003; Whiting & Edwards, 1988), biological changes in neurological and anatomical supports for skills (Carey & Gelman, 1991; G. Dawson & Fischer, 1994; Fischer & Rose, 1996), and the limits that available time places on the speed and scope of skill construction. These same dynamics also cause the opposite pattern—major disparities in ages of skill emergence in some domains under some circumstances, as shown in Figures 7.10, 7.15, and 7.16.

Developmental clustering is a macrodevelopmental phenomenon that does not appear directly in microdevelopment. Yet it arises from the combination of microdevelopmental processes in many contexts leading to clusters of discontinuities for each developmental level. Conversely, macrodevelopmental constraints limit microdevelopmental processes at any given time because people build on skills they have accumulated over time and have upper limits on complexity reflected in functional and optimal levels. Full understanding of developmental transitions thus requires studying the relations between micro- and macrodevelopment.

Construction Processes: From Micro to Macro

A major obstacle to studying the relations between micro- and macrodevelopment has been an absence of research methodologies for including both levels of analysis in one study. Conceptual frameworks and research methodologies for the study of short- and long-term change have grown up independently. On the one hand, macrodevelopment has been studied mainly in terms of the broad structural models of Piaget (1983, 1985), Werner (1948), and the experimental/psychometric approach focusing on input and output (Horn & Hofer, 1992; Klahr & Wallace, 1976). Typically, research has used cross-sectional or longitudinal methods to describe the successive forms of psychometrically scaled performance or mental structure at widely spaced points over the life span. Such approaches make no reference to the everyday short-term functional adaptations that lead to long-term changes.

On the other hand, microdevelopment has been studied as a process of relatively immediate functioning in adaptation to specific environments. Whether such adaptations are conceived as individual learning (Bandura, 1977; Skinner, 1969) or as internalization of between-person control (Rogoff, 1990; Vygotsky, 1978), researchers taking functional approaches have done little analysis of long-term structural change.

Contemporary task-analytic methods make it possible to overcome this methodological divide and study the ways that short- and long-term reorganizations relate within a common framework (Goldin-Meadow, 2003; Granott & Parziale, 2002; Miller & Coyle, 1999; Siegler & Crowley, 1991). Common scales and concepts make it possible to describe psychological organization in terms of executive control structures for specific tasks, contexts, and collaborations, thus relating micro- and macrodevelopment. The skill complexity scale makes it possible to use the same scale (Figure 7.3) to analyze both microdevelopment and macrodevelopment. Researchers can relate changes in children's short-term performance on a task, such as problem-solving efficiency, strategies, and errors, directly to

changes in hierarchical organization of control structures for performance.

This research has led to advances in our understanding of (a) the central transition mechanism of co-occurrence or shift of focus, (b) gradual construction of new structures through building, repetition, and generalization as evidenced in the shapes of growth curves, (c) microdevelopment from novice to expert in a domain, and (d) the process of bridging by which people bootstrap themselves to higher-level new skills.

Shift of Focus in Transitional States

A fundamental mechanism of transition in hierarchical integration is co-occurrence or shift of focus (Fischer, 1980b). Research across dozens of different tasks in several laboratories have converged on this common microdevelopmental phenomenon: When individuals are beginning to develop a new skill, they shift between two different representations or two different strategies, each of which is only partly adequate to the task (Bidell & Fischer, 1994; Goldin-Meadow, 2003; D. E. Gottlieb, Taylor, & Ruderman, 1977). Piaget (1952) and Baldwin (1894) described transitions as involving *groping,* in which children search intuitively for ways of combining and differentiating skills in a new form. For example, just before coming to understand conservation of liquid in containers of different shapes, children often represent the height of the liquid verbally while simultaneously representing the width in gesture (or vice versa). A few days or weeks later, they have integrated the two dimensions to form a skill for conservation, taking a major step in an important macrodevelopmental achievement. Goldin-Meadow and her colleagues (1993) have shown that such dual representations dependably indicate a transitional state in the development of skills such as conservation and mathematical equivalence. This transition process occurs in emotional development as well where opposites such as nice and mean routinely co-occur in children's activities when they are working on integrating these opposites (Fischer & Ayoub, 1994; Harter & Buddin, 1987).

Many transitions involve such construction of new skills from co-occurring components, although many also involve a change in the mixture of skills or strategies applied to a task (Siegler & Jenkins, 1989). The diverse studies of co-occurrence provide a new before-and-after picture of transitions: At first, a person concurrently uses less adequate skills for a given task, and that co-occurrence instigates groping to differentiate and integrate the skills to form a new hierarchically inclusive skill that is more adequate to the task.

Shapes of Growth Curves in Construction and Generalization of New Skills

Microdevelopmental analysis illuminates the real-time process of coordination and differentiation of the co-occurring skills to form a new skill. Individual growth curves are analyzed, not combinations of standardized data from many students (Estes, 1956; Fischer, 1980a; Granott & Parziale, 2002; Siegler & Crowley, 1991; Yan & Fischer, 2002). Changes in learning and generalization can be analyzed and compared across skills and tasks, tracing, for example, the progress of generalization of new knowledge to different tasks and contents by individual students or ensembles. Commonly, the progress of learning can be directly detected, including the nature of construction of a skill and the generalization of that skill to new situations. The skill complexity scale in Figures 7.3 and 7.4 greatly facilitates the research by providing a common scale for comparison of growth of diverse skills.

A key tool for analysis is the shapes of growth curves. In everyday learning activities, people produce complex growth patterns, with activities that differ widely in complexity, varying from moment to moment within a range that does not show simple upward progression. With the insights of dynamic systems theory, many cognitive scientists recognize that complex trajectories capture the true shapes of learning and development. Real-time trajectories do not move along a straight line, but instead they typically fluctuate up and down within a range that reflects constraints.

Analysis of growth curves shows a prototypic pattern for building and generalizing a new skill: People build a skill and then repeatedly rebuild it in a wavelike pattern of construction and reconstruction, not in a straight line or monotonic upward progression. Encountering a new task or situation, people first move down to a low level of complexity as illustrated in Figure 7.18, using basic skills similar to those of young children. They then gradually build a more complex skill for coping with the task by repeatedly rebuilding it with variations (Fischer et al., 2003; Granott, 2002). That is, when they encounter some change in the narrow context, their skill collapses and they regress back to a low level and then rebuild the skill again in this new context. With naturally occurring changes in context or state, their skill collapses over and over, and they adapt and rebuild it each time in a different way. This pattern is often called

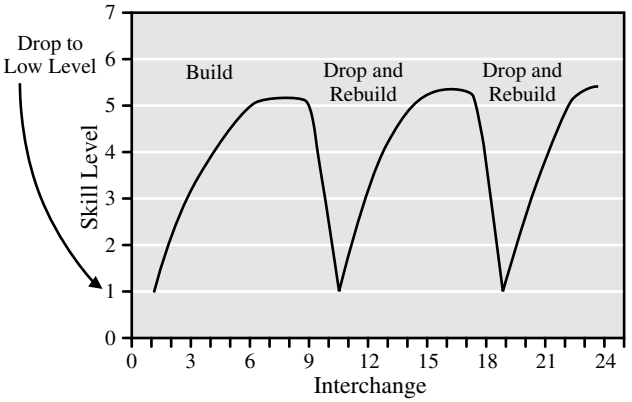


Figure 7.18 Building a new skill through repeated reconstruction, or scalloping. *Source:* From "Adult Cognitive Development: Dynamics in the Developmental Web" (pp. 491–516), by K. W. Fischer, Z. Yan, and J. Stewart, in *Handbook of Developmental Psychology,* J. Valsiner and K. Connolly (Eds.), 2003, Thousand Oaks, CA: Sage.

"scalloping," as in Figure 7.18, because it builds gradually and then drops, forming the approximate shape of a scallop shell. Through this slow process, people gradually build a more general skill that they can sustain across a set of variations in context. Scientists have described this process extensively for infants and young children, where it is called a "circular reaction," (Piaget, 1952; Wallon, 1970), but it occurs at all ages in new learning situations (Fischer & Connell, 2003).

Figure 7.19 illustrates this phenomenon in a dyad of graduate students learning a new skill in a study by Nira Granott (1994, 2002). Ann and Donald were trying to understand a Lego robot that changed its movement in response to light. (The study was done when Lego robots were under development at the Media Laboratory at MIT before they were available in toy stores.) Ann and Donald knew nothing about how the robot worked or what it responded to. They tried to figure out what it was and how it functioned. Beginning at a very low level of complexity in understanding the robot, they worked closely together over a period of half an hour to gradually build a more complex shared understanding of the robot. Their understanding of how the robot moved across the floor fluctuated in skill complexity, as shown in Figure 7.19, starting from primitive egocentric actions that confused the robot's properties with their own actions and moving to complex representational systems that specified the robot's concrete characteristics.

Instead of a single upward trend toward a more adequate understanding, Ann and Donald's skill was fragile, building and collapsing several times, as illustrated by the panels marked by dashed vertical lines in Figure 7.19. Seemingly small changes in the situation led to collapse of their skill to low levels, marked by egocentric actions that confused their own activities with properties of the robot. After each collapse they rebuilt their understanding again. After their initial growth of skill (first panel: Start), a wire fell out of the robot, and they unknowingly placed it back in a different socket, producing a different response in the robot. With this change in the robot, their skill level plummeted, and they began again (second panel: Redo Wire 1). Then someone else joined them and asked what they were doing. In response to the need to explain their actions, their skill collapsed to a low level again, which they gradually built up again over several minutes (third panel: Summary). After finishing their explanation they purposely removed a wire from the robot and placed it

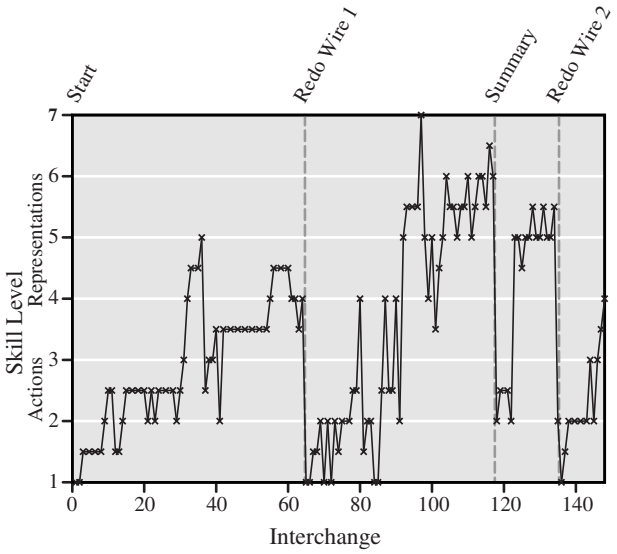


Figure 7.19 Microdevelopment of understanding a Lego robot: Repeated reconstruction of skill. A dyad, Ann and Donald, worked together to understand a Lego robot that changed movement in response to light. Their joint problem solving involved repeated reconstruction, as they moved through four construction episodes in a half hour. *Source:* From "Microdevelopment of Co-Construction of Knowledge during Problem-Solving: Puzzled Minds, Weird Creatures, and Wuggles," by N. Granott, 1994, *Dissertation Abstracts International, 54*(10B), p. 5409; and "How Microdevelopment Creates Macrodevelopment: Reiterated Sequences, Backward Transitions, and the Zone of Current Development" (pp. 213–242), by N. Granott, in *Microdevelopment: Transition Processes in Development and Learning,* N. Granott and J. Parziale (Eds.), 2002, Cambridge, England: Cambridge University Press.

in a different socket. Once again their skill collapsed and had to be rebuilt (fourth panel: Redo Wire 2).

Notice that this study involved a dyad working together, not separate individuals solving a problem. Many studies of microdevelopment benefit from analyzing learning in such social situations. Not only is the social setting more natural and ecologically valid, but it provides a richer source of data for analyzing learning. Collaboration makes the learning process more visible, as students communicate in ways that externalize the learning process (verbal exchanges, gestures, joint activities). Individuals working by themselves do much less externalization of learning, making it more difficult for researchers to study how they learn.

In summary, repeated building and collapse with changes in the situation show the fragility of new skills, which are usually difficult to generalize (Fischer & Immordino-Yang, 2002; Salomon & Perkins, 1989). Minor changes in the situation cause the skill to fall to a low level and require reconstruction, as shown in the scalloping model in Figure 7.18. We propose that this process of repeated rebuilding is an essential mechanism for creating a generalizable skill.

Learning Takes a While: Growth from Novice to Expert

Building new, generalizable skills usually takes a long time, especially for domains that are taught in school and valued in society such as literacy, mathematics, science, and art. Becoming an expert in a field typically requires 5 to 10 years of learning (Ericsson & Charness, 1994; Gardner, 1993; Hayes, 1985). Creating new general knowledge in a field likewise takes a long time, as when Darwin built the outline of the theory of evolution over a period of 8 years (Gruber, 1981), and then spent the rest of his life generalizing and differentiating it for dozens of topics in biology. Becoming an expert on a task or in a smaller domain may be accomplished in weeks or months, but it still takes time.

Novices and experts show distinct patterns of microdevelopment in their approach to a task, and as people move from novice to expert they produce an intermediate pattern that is equally distinctive. In a microdevelopmental study of graduate students learning to use a computer to calculate simple statistical operations such as the mean of a data set, students showed the three patterns in Figure 7.20 (Fischer et al., 2003; Yan, 2000; Yan & Fischer, 2002). Novices produced erratic, chaotic growth curves, shifting frequently between high and low skill levels as shown in the top row. Students with intermediate skill showed the scalloping pattern, building and sustaining a more complex skill for more than one interchange, as illustrated in the middle row, as well as Figures 7.18 and 7.19. Experts often began at a low level but moved quickly to a skill level appropriate for the task at hand and mostly remained there except for occasional brief drops with mistakes or confusions.

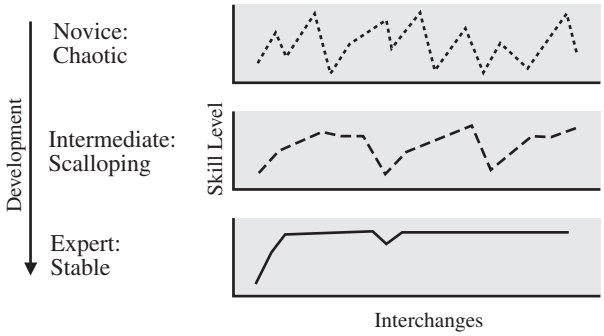


Figure 7.20 Growth curves for novice, intermediate, and expert skill use. *Source:* From *Dynamic Analysis of Microdevelopment in Learning a Computer Program,* by Z. Yan, 2000, Unpublished Doctoral Dissertation, Harvard Graduate School of Education, Cambridge, MA; and "Always under Construction: Dynamic Variations in Adult Cognitive Development," by Z. Yan and K. W. Fischer, 2002, *Human Development, 45,* pp. 141–160.

Across four assessments during the one semester course, approximately 40% of the students progressed from novice to intermediate patterns or from intermediate to expert. (Some of the students also showed backward movement from intermediate to novice patterns, apparently becoming confused as the course progressed from simpler to more challenging tasks.) Patterns of growth curves in learning and problem-solving situations thus provide straightforward ways of assessing how people build skills in the short term as well as how those skills relate to long-term development and expertise.

Multiple Dimensions of Learning and Development

Uncovering patterns of microdevelopment like those in Figure 7.20 requires observing the strands along which people are learning new skills. Growth commonly occurs along multiple concurrent strands and threads within strands, some of which show learning and some of which do not (Fischer & Granott, 1995). A given activity does not occur only on one dimension or at one developmental level but at different levels along different cognitive and emotional strands.

In the robot study, for example, Ann and Donald showed two separate but related strands intertwined in the same activity—understanding the robot and verbal communication with each other—which produced strikingly different patterns of growth. In contrast to the scalloping pattern for understanding the robot, the verbal strand showed a consistently higher level of skill and no systematic change over the course of the session, as shown in the top, dashed line in Figure 7.21 (which shows interchanges for only the first panel from Figure 7.19). Ann and Donald maintained effective representational communication during their joint problem solving but showed no systematic growth in the complexity of that communication. At the same time, their understanding of the robot (which was evident through their communication) did show systematic change, forming a scalloping pattern. A superficial analysis of the verbal interactions between Ann and Donald would have missed the process of understanding the robot and showed a relatively flat, stable trajectory in their representational communication, with some fluctuation but no learning. Activity involves multiple, simultaneous strands (dimensions) that are genuinely distinct aspects of the same activity, and in a learning situation only some of these strands demonstrate systematic change.

An important ancillary point is that these students were capable of higher levels of skill than they showed in either strand. Based on their performance in graduate courses and their ages, they were capable of using complex abstract skills, at least mappings at Level Ab2 and systems at Level Ab3, but they did not show these levels in their activities with the robot. People use the skill levels that are required for a task and do not employ the higher levels of which they are capable unless the situation demands it.

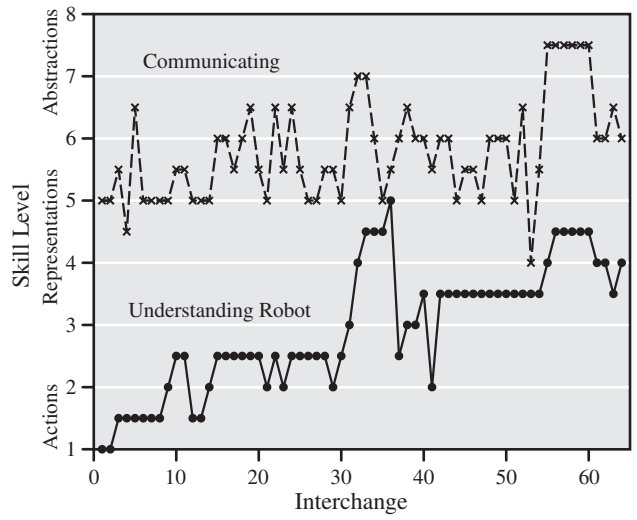


Figure 7.21 Two strands in Ann and Donald's first problem-solving sequence. *Source:* From "Beyond One-Dimensional Change: Parallel, Concurrent, Socially Distributed Processes in Learning and Development," by K. W. Fischer and N. Granott, 1995, *Human Development, 38,* pp. 302–314.

Detecting the dynamic nature of learning in microdevelopment requires (a) finding the strands or threads that are growing and (b) distinguishing them from the ones that are merely varying without growing. Methods that recognize the multiple levels of functioning in an activity facilitate distinguishing these different threads and thus uncovering microdevelopment. With such methods, it becomes possible to see how people build skills from low levels and how they rebuild them repeatedly to generalize and consolidate them. Generally, the complex webs of macrodevelopment derive from these microdevelopmental strands, which grow, join, and separate to produce nonlinear long-term development of skill and understanding.

Bridging: A Process of Building New Knowledge

One of the mysteries of learning has been that people somehow build knowledge that is *new* for them. That is how different people end up with very different knowledge. The origins of new knowledge have puzzled philosophers for centuries (Kant, 1958; Plato, 1941) and continued to puzzle twentieth-century scholars (Fodor, 1975). When people appear to have no knowledge of, say, a Lego robot's functioning, how can they build new knowledge of the gadget? How can they build new knowledge out of nothing?

The reason for this dilemma lies (again) in the limitations of the paradigm of structure-as-form. People do not build new knowledge from nothing! It only seems that way because scholars assume that people function at only one level of knowledge. In fact, people function at multiple levels, and so they can use one level of functioning to direct their activities at another level. They can build up new knowledge by using old knowledge from other contexts to bootstrap themselves (Dunbar, 2001; Kurtz, Miao, & Gentner, 2001).

One important way that people do such bootstrapping to build knowledge is the process of *bridging* in which people direct the construction of their own knowledge by functioning at two levels simultaneously (Case, 1991a; Granott et al., 2002). They unconsciously establish a target skill or understanding, which lies unconstructed beyond their current level of functioning, and

they use it as a shell for constructing understanding. The shell functions like a grappling hook for mountain climbers, pulling activities up toward the target level. Often the shell is based on an analogy or metaphor, like the frameworks for meaning that Lakoff (1987) and other cognitive linguists have described. Teachers and other people can also provide bridging shells for learners such as Case's number line metaphor as a central conceptual structure for arithmetic in young children (Case et al., 1996).

In the process of bridging, the target shells that people build are often partial and fuzzy, but they provide a framework that directs the search for new knowledge. People then use their activities to gradually fill in components of the shell until they have moved themselves to a higher level of understanding for the new task in context. Experts presumably use bridging shells, too, but ones that are less fuzzy and more articulated for relevant domains and that facilitate rapid skill building and problem solution, as in the third row of Figure 7.20.

An example from a second dyad working with a Lego robot illustrates how bridging works (Granott et al., 2002). Kevin and Marvin did not know that their robot responded to sound. When they began their explorations of the robot, they played with it for a few minutes, exploring what happened. After a few minutes, they showed their first case of bridging—a vague reference to undefined cause and effect that provided an outline around which to build a skill: Marvin placed his hand around the robot in different positions to see what would happen, and Kevin said, "Looks like we got a reaction there."

The term reaction suggested cause and effect, action and re-action, but Kevin gave no specifics because he did not yet know enough. It was not clear what in Marvin's action (or in something else) was the cause or how the robot's movement changed in reaction. The two students did not know even that the robot responded to sound, and they had not yet detected relevant patterns in the robot's movements. Still, the idea of reaction did imply a causal connection, content unknown. Through it, Kevin and Marvin set up a bridging shell that effectively posited two unknown variables, *X* and *Y,* related to each other:

$$\underset{\text{Shell}}{\left[\ (X) \overset{\text{Reaction}}{\text{——}} (Y)\ \right]} \qquad (2)$$

Parentheses around the letters in the formula indicate that the components were unknown for Marvin and Kevin. This shell linked action *X* with response *Y* as a reaction to *X.* The shell was still devoid of content, but it marked an existing unknown causal relation. Bridging follows the basic structures of skill development except that some components of the shell start out unknown or partially known, like algebra in action. The number and nature of unknown components differ with developmental level.

Through construction of a shell, bridging operates like the pillars on an overhead highway that is under construction. The pillars have been put in place, but they do not yet carry the roadway that will eventually be built on top of them. Just as the horizontal beams and the concrete between the pillars are still missing, the content—the specific cause and effect—in Kevin's brief statement is missing. Like the empty pillars, the bridging shell traces the target causal mapping and prepares a frame for building it. Although the bridging shell is currently hollow or empty, Kevin and Marvin will organize new experiences with the shell and thus introduce meaning to it.

After Kevin and Marvin introduced the reaction shell, they continued to play with the robot and observe how it reacted. A few minutes later, they had built a causal relation, saying: "When it comes over here and as soon as it gets underneath part of the shadow there, it starts changing its behavior." This statement specified an elementary causal connection between the robot's coming under the shadow and its change in behavior and thus filled in the first instances of *X* and *Y* in the skill shell:

$$\left[\ \begin{matrix}\textbf{UNDER}\\ \textbf{SHADOW}\end{matrix} \overset{\text{Reaction}}{\text{——}} \begin{matrix}\textbf{CHANGES}\\ \textbf{BEHAVIOR}\end{matrix}\ \right] \qquad (3)$$

The bridging shell defined by reaction guided Kevin and Marvin to formulate a first causal relation or hypothesis indicating that a shadow produces a change in the robot's behavior. After this beginning use of the bridging shell, Kevin and Marvin elaborated it to grope their way to what eventually became a relatively sophisticated, partially stable understanding of the robot.

In overview, microdevelopmental analysis richly captures the dynamics of activity, development, and learning. When people construct skills at new levels of complexity for a given task or situation, the more complex skills are initially tenuous and only become relatively stable gradually over long periods. Working socially as well as individually, people juxtapose or shift between relevant component skills, and they move

gradually through processes of coordinating these components to form higher-level skills. To facilitate their own skill construction, they build shells at higher levels to bridge or bootstrap themselves to new knowledge. Over time, they build and rebuild each skill again and again with each small change in task and context until they consolidate their performance to form a skill of some generality. Once new skills are consolidated, people can use them as bases for further constructive activity, including generalizing to new situations and building additional coordinations. Even when skills are consolidated, of course, they are not uniformly available at will. They remain subject to the many dynamically interacting factors that make up human activity.

Microdevelopmental analysis of learning and problem solving makes especially evident the great variability in the structures of human activity from moment to moment. Another traditional domain in which variability is prominent is emotional development. Traditionally, emotion has been treated as separate from cognition (another instance of reductionist distortion), but the revolution in emotion research in the last 25 years has radically changed that view. Emotion and cognition are not in fact separate but are two sides of the same coin. Indeed, microdevelopment and emotion are two of the domains leading the way in moving beyond the structure-as-form paradigm to create dynamic structuralism.

EMOTIONS AND THE DYNAMIC ORGANIZATION OF ACTIVITY AND DEVELOPMENT

Emotions show powerfully how dynamic structural analysis illuminates human activity and its development. In the past 25 years, emotions have reclaimed center stage in the study of human action and thought, after decades of neglect in the mid-twentieth century during the eras of behaviorism and cognitivism (Damasio, 1994; Frijda, 1986; Lazarus, 1991; Scherer, Wranik, Sangsue, Tran, & Scherer, 2004). Scholars have constructed a new framework for understanding emotion that belongs in the center of the new dynamic structuralism, combining traditional concerns about both structure and function in a single analytic system. The general framework is typically referred to as the "functional approach" because of its emphasis on the adaptive (functional) role of emotions in human activity. Consistent with dynamic structuralism, however, the functional focus is combined with structural analysis, so a more appropriate label would be the functional-structural or functional-organizational approach to emotions (Fischer et al., 1990; Mascolo et al., 2003; Sroufe, 1996). We illustrate the use of several interrelated kinds of structures to analyze emotional functioning, including information flow, script, categorical hierarchy, dimensional split, developmental level, developmental web, and dynamic growth curve. No single analysis by itself can capture all the important aspects of the organization and functioning of emotions—which is typical of dynamic phenomena.

Emotion and Cognition Together

Contrary to common cultural assumptions, emotion and cognition operate together, not in opposition to each other. The official journal of the International Society for Research on Emotion is entitled *Cognition and Emotion* to reflect this point. *Cognition* generally refers to the processing and appraising of information, and *emotion* refers to the biasing or constraining effects of certain action tendencies that arise from appraisals of what is beneficial or threatening to a person (Frijda, 1986; Lazarus, 1991; Russell & Barrett, 1999). Thus, cognition and emotion are two sides of the same coin as characteristics of control systems for human activity. Emotion is together with cognition at the center of mind and activity.

Analysis of emotion highlights the role of the body and social world. Minds are not merely brains that happen to be in bodies. People's minds are parts of their bodies, and their mind-bodies act, think, and feel in a world of objects and other people. This ecological assumption is fundamental to the dynamic structural framework and applies to analysis of all human activity. Emotions are one of the most important organizing influences on people's mind-bodies in context—fundamental biological processes that shape action and thought. Contrary to common parlance and much classic theory, emotions are not merely feelings or inner experiences of individuals but integral parts of human activity, shaping action and thought, and founded in social interactions.

In the history of psychology, a distinction has often been made between emotion and affect, with emotion referring to biologically driven reactions and affect emphasizing individual experience and meaning (T. Brown, 1994). By these definitions, modern functional/structural analysis deals with affect rather than emotion, but recent researchers' emphasis on biological factors has led to general preference for the term *emotion.* In this modern meaning, emotion is used in a broad sense to include the classical meaning of affect. We use emotion

and affect interchangeably to refer to the broad ways in which activities are organized by action tendencies arising from people's appraisals.

Adaptation and appraisal are two fundamental concepts in emotion. They are captured in the basic definition of emotion process: People act in contexts where their activities are embedded in events (*in medias res*). Emotions arise from appraisals of the events based on each person's many specific concerns (goals, needs). An emotion is an action tendency (constraint, bias) that arises from an appraisal and molds or structures a person's activities to shift the state of affairs toward his or her goals and needs. The central process in emotion is the action tendency, the way that an emotion organizes activity. Actions, thoughts, experiences, physiological reactions, and expressions of body and voice are all organized by the action tendency of an emotion.

When people feel ashamed, for example, they want to be evaluated positively in some context, but instead someone judges them negatively for something they did or said or for some characteristic of theirs, especially something that indicates a serious flaw (Tangney & Dearing, 2002; Wallbott & Scherer, 1995). They typically lower their eyes, conceal their face, blush, and stay quiet. They try to escape or hide, and they may try to blame others for the event or characteristic. Subjectively, people feel uncovered, small, or heavy, and they focus on their shameful flaw. Emotion refers to this entire process, including appraisal, social context, physical reactions, activities, and subjective experiences, but especially the action tendency that organizes the shame reaction.

The processes of emotion are diagramed in Figure 7.22, which presents a schema for the information processes that many emotion theorists propose (Fischer et al., 1990; Frijda, 1986; Lazarus, 1991). For the situation in which people are acting, they detect a *notable change* (first box on the left in Figure 7.22), involving some difference in the situation or some violation of expectations. For a case of shame, people may notice that they have acted poorly or broken some rule, or they may observe someone expressing contempt or disgust toward them.

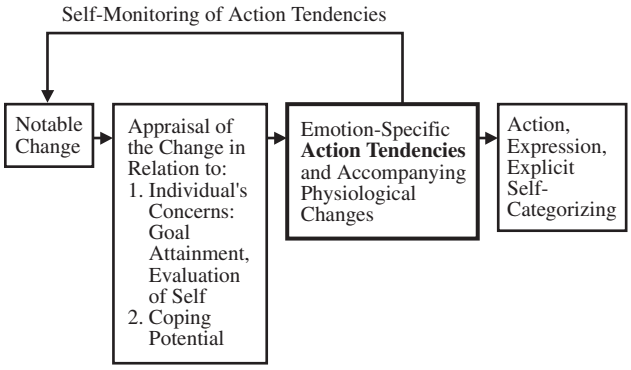

Self-Monitoring of Action Tendencies
Notable Change
Appraisal of the Change in Relation to:
1. Individual's Concerns: Goal Attainment, Evaluation of Self
2. Coping Potential
Emotion-Specific **Action Tendencies** and Accompanying Physiological Changes
Action, Expression, Explicit Self-Categorizing

Figure 7.22 Emotion process.

They then appraise the situation for its affective meaning—its significance in their own specific concerns (second box). Despite the cognitive, conscious, deliberate connotations of the word *appraisal,* this process typically occurs unconsciously and quickly. One result of the appraisal is a general positive or negative evaluation of whether the situation promotes or hinders goal attainment or wish fulfillment (promoting accomplishments or preventing troubles) according to Higgins and his colleagues (1996). Situations that compromise people's concerns produce negative emotions such as shame, fear, sadness, and anger. Those that promote people's concerns produce positive emotions such as pride, joy, and love or affection.

A person also appraises the situation for coping potential, how well he or she can deal with or change the emotion-producing aspects of the situation. When circumstances are desirable, a person may try to sustain or further them or may simply enjoy them. When circumstances compromise a goal or need, a person assesses what can be done to change the situation—undoing, altering, or escaping from the negative circumstance. Appraisal that a negative situation can be undone or altered leads to emotions such as anger or guilt. An appraisal that it cannot be undone or changed leads to sadness or shame. Appraisal that it can be escaped leads to fear or shame.

Each appraisal produces an action tendency (third box in Figure 7.22), a pattern of activity based on evaluation and coping potential that is an unconscious plan of action for the situation. Each emotion has a prototypic, often preemptive, action tendency, which takes over control of activity. People tend to act in a certain way and to perceive and interpret events according to specific biases, and their bodies change physiologically to prepare for the planned actions.

Beyond early infancy, people also engage in self-control efforts in which they try to alter their own perceptions and actions. For shame, action tendencies include trying to hide or escape from observation, lowering the head or covering the face, feeling small and exposed, and becoming preoccupied with the negative action or characteristic. Self-control efforts include

trying to change the negative action or characteristic, deny or disguise it, or blame someone else for it.

The boxes in Figure 7.22 suggest an approximate order for these emotion processes, although they typically occur in parallel and cannot be separated as fully as the boxes may imply. The implications of separateness and sequentiality are a limitation of information-flow analysis. After a person has fully developed an emotion, the processes become seamless and automatic. Emotions appear to occur unconsciously, washing over us autonomously, despite the fact that the processes are complex and derive from a long period of development. The heart of the emotion is the action tendency, which is indicated with darkened lines in Figure 7.22.

In addition to the sequence of processes from left to right, there is a feedback loop in which older children and adults appraise their own affective reactions and move back through the entire set of emotion processes, reacting emotionally to their own emotion and exerting efforts at self-control. This loop often results in an emotion about an emotion, as when a person becomes angry about feeling ashamed or becomes afraid about feeling love or affection.

Organizing Effects of Emotions

The ways that emotions organize activities are powerful and pervasive. Among the structural descriptions used to characterize these organizing influences are: (a) scripts for prototypical organizations for particular emotions, (b) categorical hierarchies, and (c) dimensions for relating emotions to each other.

These empirically derived descriptions of the organizing effects of emotions illustrate especially well how biology and experience work together in human development (Damasio, 2003; Fischer et al., 1990). Nativist theorists often emphasize the constraints or biases that genes place on human action and thought (Carey & Gelman, 1991; Spelke, 2000). At the extreme, nativist researchers look for the early or "first" emergence of some piece of knowledge or emotion, and then claim that this early development shows that the knowledge or emotion is innately present from an early age. Such an approach neglects the developing organization of human activity, reducing analysis to description of a few innate elements, as we discussed earlier. Emotions and emotional development show powerfully how biological constraints dynamically affect the developing organization of activities as they are constructed through experience and culture. Emotions are a paradigm of how the dynamics of development can produce simultaneously both "basic" categories and complex behavioral organizations (Camras, 1992; Russell & Barrett, 1999).

Scripts

A useful way of describing the organization of emotions is with prototypical emotion scripts—descriptions of the prototype or best case of the antecedent events and reactions involved in a common emotion such as anger, fear, love, or shame (Mascolo et al., 2003; Shaver, Schwartz, Kirson, & O'Connor, 1987). These kinds of scripts have been used extensively in cognitive psychology to describe a standard sequence of events that many people share—the prototype or best instance of a certain category (Schank & Abelson, 1977). Prototypic emotion scripts are inferred from stories that people tell about emotions, characteristics that people attribute to emotions, and reactions that people show in emotion-inducing situations.

In a standard format for scripts, antecedents describe the notable change in the situation that evokes an emotion, responses describe the action tendencies that the emotion produces, and self-control procedures describe the ways that people attempt to change or limit the emotion. Tables 7.3 and 7.4 present prototypes for the nega-

TABLE 7.3 Prototypical Script for Adult Shame

Antecedents: Person's Flaw, Dishonorable or Deplorable Action, Statement, or Characteristic
A person acts in a dishonorable way, says something deplorable, or evidences a characteristic that is disgraceful or flawed.
Someone witnesses this action, statement, or characteristic and judges it negatively.
Responses: Hiding, Escaping, Sense of Shrinking, Feeling Worthless
The person tries to hide or escape from observation or judgment, feels small, exposed, worthless, and/or powerless.
The person lowers the head, covers the face or eyes, or turns away from other people. Sometimes he or she strikes out at the person observing the flaw.
He or she is preoccupied with the negative action, statement, or characteristic as well as with negative evaluation of self more generally.
Self-Control Procedures: Undoing and Redefinition
The person may try to change the negative action, statement, or characteristic, or deny its existence, or disguise it.

Source: Adapted from "The Organization of Shame Words in Chinese" by J. Li, L. Wang, & K. W. Fischer, 2004, *Cognition and Emotion, 18,* pp. 767–797 and *Self-Conscious Emotions: The Psychology of Shame, Guilt, Embarrassment, and Pride,* by J. P. Tangney and K. W. Fischer (Eds.), 1995, New York: Guilford Press.

TABLE 7.4 Prototypical Script for Adult Love

Antecedents: Other Person's Attractiveness, Meeting of One's Needs, Good Communication, Sharing of Time and Special Experiences
The individual finds another person attractive, physically and/or psychologically.
The other person meets some of the individual's important needs.
The two communicate well, which fosters openness and trust; they have spent much time together and shared special experiences.
Responses: Feeling Happy and Secure, Wanting to Be Close, Thinking about the Other Person
The individual feels warm and happy and tends to smile, especially when thinking of the other person or being with him or her.
The individual thinks about the other person, wants to be with him or her, to spend time together (not be separated), to make eye contact, to hold, kiss, and be intimate (psychologically and/or sexually), and to express positive feelings and love to the other.
The individual feels more secure and self-confident, and accentuates the positive side of events.
Self-Control Procedures: Not a Salient Issue
(Suppression of love is possible in the interest of decorum or the avoidance of embarrassment, guilt, or rejection, but such self-control efforts are not prototypical, at least in the United States.)

Based on "Is Love a 'Basic' Emotion?" by P. R. Shaver, H. J. Morgan, and S. Wu, 1996, *Personal Relationships, 3,* pp. 81–96; and "Emotion Knowledge: Further Exploration of a Prototype Approach," by P. R. Shaver, J. Schwartz, D. Kirson, and C. O'Connor, 1987, *Journal of Personality and Social Psychology, 52,* pp. 1061–1086.

tive emotion of shame and the positive one of love. The main organizing influences (action tendencies) for shame are to hide, escape, feel exposed, and become preoccupied with the cause of the shame. The main organizing influences for love are to feel happy and secure, to want to be close to the loved one, and to think about the loved one. Control procedures are typically important for negative emotions such as shame but minimal or nonexistent for positive emotions such as love, because in the prototypic situation there is no desire to avoid or eliminate the positive emotion. Real-life occurrences of emotions are inevitably more complex than simple prototypes, and control procedures do occur with positive affects as well, depending on the variable circumstances of the specific occurrence.

Families of Emotions, Dimensions, and Cultural Variations

Human beings experience many different emotions, and scholars have sought to find an organization underlying all these variations, relying on facial expressions, emotion words, personality types, and various other data to infer relations among emotion types or categories. In general, most categories function through prototypes, forming family resemblances related by similarities to best instances (prototypes). The study of knowledge was revolutionized in the late twentieth century by the realization that most categories function in terms not of exclusive logical definitions but of overlapping prototypes, which organize categories into basic families (Lakoff, 1987; Rosch, 1978; Wittgenstein, 1953). Emotions fit this organization just like most other categories.

One of the striking findings about emotion categories has been the similarity of basic families for emotion words with those for emotional expressions in face, voice, and action. The convergence across these components of human activity is remarkable, as illustrated by the prototypic families for emotion words in English, Indonesian, Italian, and Chinese shown in Figure 7.23 (Shaver, Murdaya, & Fraley, 2001; Shaver et al., 1992). The six emotion families of anger, sadness, fear, shame, love, and happiness also appear in many analyses of facial expressions for basic emotions (Ekman et al., 1987), along with a few additional emotion categories such as disgust and surprise. (The additional categories are not basic families but subordinate items within one of the families in Figure 7.23.)

Besides the basic categories of emotion families, there are higher degrees of abstraction in which families and emotions are related through superordinate categories or dimensions such as positive-negative evaluation. There are also lower degrees of abstraction, in which families divide into subordinate categories, and then the subordinate categories subdivide further into lower-level categories and eventually specific emotion words. For example, in Figure 7.23 clusters of Chinese emotion words form the subordinate categories of sorrowful love and unrequited love in the Sad Love family and the subordinate categories of guilt/regret and shame in the Shame family.

At higher degrees of abstraction, emotion categories fall along several dimensions defining an emotion space. The most prominent dimension is usually evaluation of positive-negative or approach-avoidance. That is why evaluation appears in the emotion process model in Figure 7.22 as part of people's first appraisal—whether an event is good or bad for them. This superordinate dimension represents one of the three dimensions that have been found in many different research traditions going back to the beginnings of experimental psychology in the nineteenth century, long before the framework for prototype

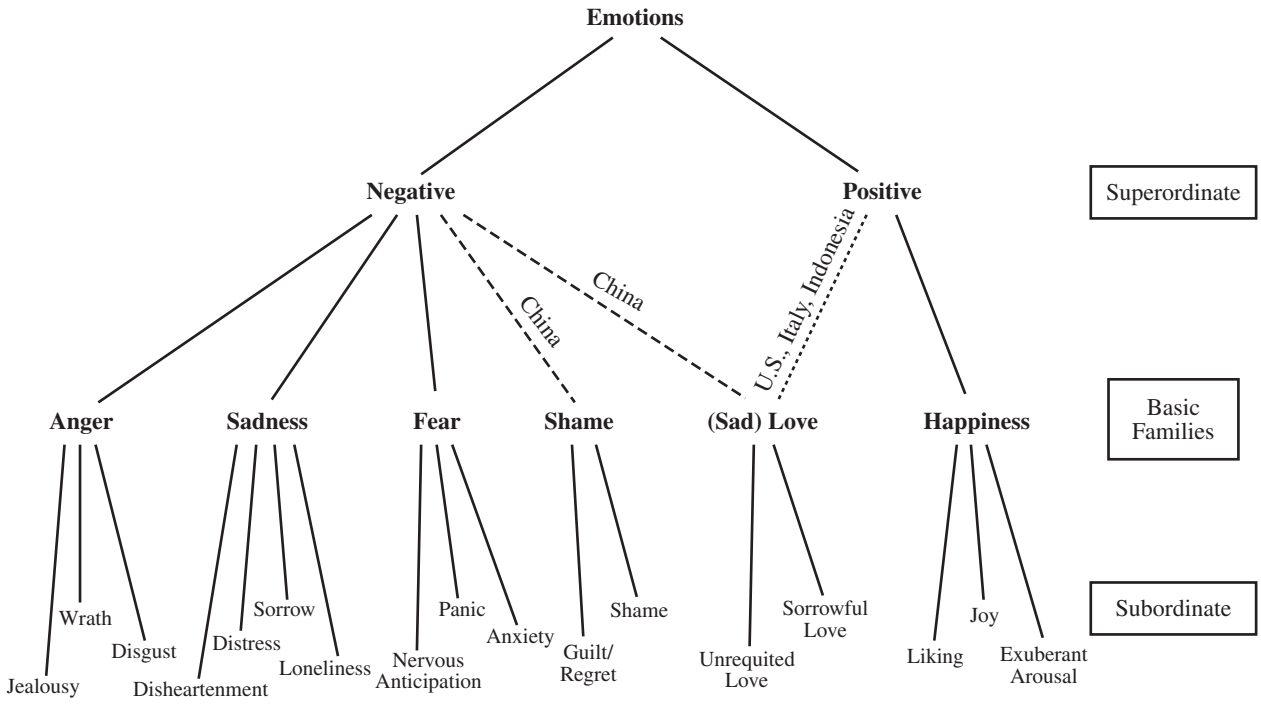


Figure 7.23 Hierarchy of emotion categories. This hierarchy represents the organization of emotion families in Chinese based on the findings of Shaver and his colleagues. Results for the United States, Italy, and Indonesia are also represented. For subordinate categories, the diagram lists only the largest categories from the Chinese sample. Dashed lines indicate findings that held for only the Chinese sample; dotted lines those for only the United States, Italian, and Indonesian samples. *Source:* From "Structure of the Indonesian Emotion Lexicon" by P. R. Shaver, U. Murdaya, and R. C. Fraley, 2001, *Asian Journal of Social Psychology, 4,* pp. 201–224; "Cross-Cultural Similarities and Differences in Emotion and Its Representation: A Prototype Approach" (Vol. 13, pp. 175–212), by P. R. Shaver, S. Wu, and J. C. Schwartz, in *Review of Personality and Social Psychology,* M. S. Clark (Ed.), 1992, Newbury Park, CA: Sage.

analysis was devised (Osgood et al., 1957; Schlosberg, 1954; Wundt, 1907).

The classic dimensions have been replicated with similar findings across many different methods, data sets, and cultures, although there are some important variations in the exact nature of the dimensions. The three general dimensions are (1) evaluation of positive-negative or approach-avoidance, which usually accounts for approximately half the variance and is shown in Figure 7.23, (2) activity or active-passive, and (3) engagement or self-other. Although dimensions (2) and (3) are not shown in Figure 7.23 because of graphical limitations, they are nevertheless present in the hierarchy as additional superordinate categories.

The basic emotion families and the dimensions of emotions are similar across cultures, probably because they reflect fundamental characteristics of the human species. In this sense, nativist arguments are correct: Emotion categories have an important species-general (hereditary) component (Ekman et al., 1987). In the studies that produced the hierarchy in Figure 7.23, Shaver and his colleagues began with a standard dictionary in each language, asking informants to pick words that involved emotions (Shaver et al., 1992, 2001). Then they used the selected words with another set of informants, who sorted the words into categories. Hierarchical cluster analysis of the sortings produced the dimensions, basic families, and subordinate families. Chinese, Indonesian, Italian, and American/English showed five common emotion families—anger, sadness, fear, love, and joy—as well as the three affective dimensions. Other researchers examining different cultures have found groupings of emotions in similar families and dimensions (Fontaine, Poortinga, Setiadi, & Markam, 2002; Heider, 1991). Claims that emotions differ fundamentally across cultures do not take these broad family groupings into account.

Alongside cultural similarities, however, cultural differences are strong and important. The hierarchies for China, Indonesia, Italy, and the United States illustrate those differences. First, the Chinese organization of love was substantially different from the Ameri-

can/Italian/Indonesian one. In the latter languages, love was categorized as a fundamentally positive emotion; while in Chinese love was sad and negative, as shown by the two main subordinate categories of sorrowful love and unrequited love. In contrast, the American subordinate categories were primarily positive, including words such as fondness and infatuation. The Chinese and American constructions of the basic family of love are clearly different.

An even greater difference was that the Chinese showed a sixth emotion family, shame, which existed in the U.S. study as only a small subordinate cluster in the sadness family, not as a separate basic family. This finding demonstrates a powerful cultural difference—an entirely different emotion family, presumably reflecting important cultural experiences (Benedict, 1946; Kitayama, Markus, & Matsumoto, 1995; Li, Wang, & Fischer, 2004). Shame is much less salient in the United States (and in many other Western cultures) than it is in China and some other Eastern cultures.

Li et al. (2004) followed up this finding by analyzing the categorical organization of the shame family in Chinese, using a method similar to Shaver's. They worked with Mandarin speakers from mainland China to identify 113 words clearly involving shame. Hierarchical cluster analysis of subjects' sortings of these words produced the hierarchy outlined in Figure 7.24. The primary superordinate dimension was self/other (one of the three common dimensions of emotion), and there were six families of shame words, with several subordinate categories for most of the families. The English names for each family and subordinate category were chosen carefully to portray the Chinese meanings, but it is difficult to capture in English the connotations of many of these Chinese emotion concepts. Interestingly, one of the families that seems familiar to U.S. culture is guilt, but it was the least differentiated shame family in Chinese, showing no clear discrimination of subordinate categories despite including an ample number of words (13).

Generally speaking, the organization of emotion concepts seems to have broad similarities across cultures, but cultural experiences simultaneously lead to powerful differences in specific emotion concepts and important variations in basic emotion families. Emotion concepts—and emotions more broadly—are not simply innate or entirely variable across cultures. Emotion organization is constrained by broad species characteristics at the same time that it involves very different

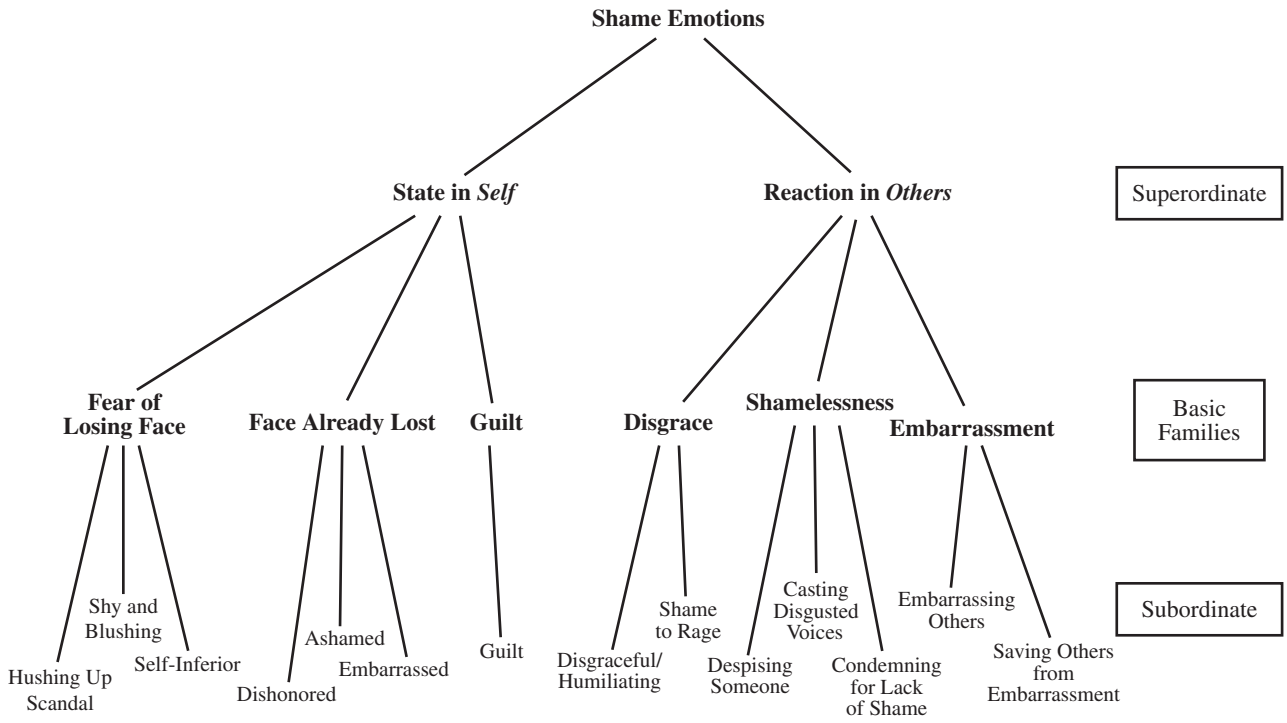


Figure 7.24 Hierarchy of shame categories in Chinese. This hierarchy shows the organization of shame categories in Chinese. For subordinate categories, only the first degree of categories is shown. *Source:* From "The Organization of Shame Words in Chinese," by J. Li, L. Wang and K. W. Fischer, 2004, *Cognition and Emotion, 18,* pp. 767–797.

structures across cultures and individuals. Techniques that focus on the variations in emotion facilitate not only description of individual variability and cultural diversity but also detection of shared characteristics of emotions across individuals and cultures.

Emotionally Organized Development

The action tendencies produced by emotions shape activities not only at the moment they occur but also as they develop. Emotional experiences have powerful effects on the shapes of developmental webs, whether they are governed by cultural norms or by more individual life events such as trauma. Research on emotional development has mostly focused on these consistent, one-way effects of emotional experiences. Frequent affective experience of a given type shapes development of a person or ensemble along a particular pathway. The general positive bias illustrated in Figures 7.6 and 7.7 is one example: People generally are biased toward the positive, particularly for attributions about themselves (Greenwald et al., 2002). Other repeated affective experiences such as recurring feelings of shame, consistent love from a caregiver, or recurring abuse lead people to develop along a globally different pathway shaped by these affective organizations. Dynamic research tools facilitate the analysis of ways that these emotions shape development.

One-Way Effects on Developmental Webs for Shame and Honor

In one broad persistent effect, people develop a strand in their developmental web that would have been minor or nonexistent without the emotional experiences. The development of a distinct sixth family for shame in China illustrates how cultural shame experiences can lead to development of an additional major branch in people's developmental web for emotions (Mascolo et al., 2003). In China and in many other Asian cultures, children experience shame and shaming repeatedly as a normal part of their socialization (Benedict, 1946; Heider, 1991; Shaver et al., 1992). As a result, they learn many shame words, they develop well-differentiated scripts and categories for shame, and they represent shame as an essential part of their everyday life: $ME_{ASHAMED}$ and $YOU_{ASHAMED}$. In U.S. culture, in contrast, many children experience much less shaming while having other negative experiences as part of their socialization. As a result, most U.S. children do not use shame words in their early vocabulary, nor do they develop well-differentiated scripts and categories for shame. Instead, they develop other negative affective scripts and categories such as ones for anger, aggression, sadness, and depression (Ayoub & Fischer, in press; Luborsky & Crits-Christoph, 1990; Noam, Paget, Valiant, Borst, & Bartok, 1994; Selman, Watts, & Schultz, 1997).

In the web metaphor for the structure of development, the American experience with shame promotes little growth of this branch of affective development. The shame family develops minimally, at least for concepts and conscious experiences of shame. (Scheff & Retzinger, 1991, argue that in America, shame continues to shape activity and experience, operating unconsciously because of its fundamental biological nature in human beings.) The Chinese experience with shame, on the other hand, produces rich growth of the shame branch of affective development, with differentiation of many subsidiary branches to form the multidimensional hierarchy in Figure 7.24.

Along with shame also goes highly differentiated development of honor and respect, which are the opposites of shame in China, unlike U.S. culture, where pride is considered the opposite of shame. This elaborate development of shame and honor leads to developmental pathways not seen in most people in English-language cultures such as the Chinese emotions of self-harmonization and social honor. Chinese children focus on succeeding in their efforts in school and other activities but always remaining modest about their achievements. The goal is to bring social honor to their family through their achievements: "My family is honored even though I am unworthy of your praise." Development of the strand for self harmonization and social honor in China contrast with development of the strand for pride in the United States, where the focus is on the child as the achiever rather than on the family (Mascolo et al., 2003).

Attachment, Working Models, and Temperament

Two domains where emotional-development research has been extensive are attachment and temperament. In both cases, the model of emotions is that they have a persistent, one-way effect on developmental pathways. According to attachment theory, children's and adults' relationships, curiosity, and general emotional security depend on the nature of their early close relationships with caregivers, usually mothers and fathers. According

to traditional temperament theory, babies are born with emotional constitutions that produce a specific pattern of emotional reaction, which pervasively affects their development and tends to remain similar from infancy to adulthood.

Attachment theory characterizes three major developmental pathways based on babies' affective experience in close relationships: secure (type B), insecure avoidant (type A), and insecure anxious/ambivalent (type C; Ainsworth, Blehar, Waters, & Wall, 1978; Shaver & Clark, 1996). A fourth pathway is sometimes added—disorganized (type D), which is associated with abuse and trauma (Cicchetti, 1990; Lyons-Ruth, Alpern, & Repacholi, 1993; Main & Solomon, 1990). For each pathway, children develop a working model of close relationships founded on their early experiences with their mothers or other caregivers (Ayoub et al., 2003; Bretherton & Munholland, 1999; Sroufe, 1996). Each child's internal working model follows a straightforward emotion script for interactions in a close relationship, with one or two emotions dominant in the script.

According to the theory, the working model pervades children's later development, especially in close relationships but also in many other aspects of life. Babies who grow up in a secure relationship build their working models primarily around the emotion of love, trusting that their mothers will be present to take care of them when needed and will allow them independence to explore and learn about the world. Babies who grow up with an avoidant attachment build their working models primarily around a combination of love and fear of rejection, learning that although their mothers usually take care of them, they often reject their babies' affection or closeness. Babies who grow up with an ambivalent attachment build their working models primarily around a combination of love and anger, learning that although their mothers usually take care of them, they often restrict their actions severely or behave inconsistently, making their infants hypervigilant about attachment and angry at restriction. Babies who grow up with a disorganized attachment respond inconsistently with their caregivers and frequently have a history of maltreatment, which we analyze in a later section. Several longitudinal studies have found some stability in attachment pathways, with moderate correlations in attachment type over years as well as clear evidence of changes in many children (Cassidy & Shaver, 1999; Fraley & Shaver, 2000; Schore, 2003; Waters, Merrick, Treboux, Crowell, & Albersheim, 2000).

Only a few studies have examined the development of children's working models directly, perhaps because attachment theory treats working models as relatively fixed after infancy. Luborsky analyzed pretend stories created by 3- and 5-year-old middle-class Anglo-American children in response to story stems about emotionally loaded situations with family or friends (Luborsky et al., 1996). In this privileged sample, the dominant working model (which Luborsky calls "core relationship theme") was positive and secure: A child wished to be loved and understood or to feel good and comfortable. The other people in the children's stories understood the child and were helpful when help was needed. The child responded confidently and was, in turn, helpful and constructive.

Some research has examined working models of relationships in adult psychotherapy patients, defining how people build on dominant emotions to form an unconscious script about relationships. The script is like a working model, but it has major negative elements connected to the patient's psychological problems, and so it is called a *core conflictual relationship script* (Luborsky, 2001; Luborsky & Crits-Christoph, 1990; Noam, 1990; Selman & Schultz, 1990). Scripts include key wishes or concerns, typical responses by others to those wishes, and one's own actions in response to the others. For example, depressed patients often wish to be loved and close with others, to be accepted and understood, but they see others as rejecting and opposing them more often than loving and accepting them. Their response to the rejection is to feel depressed and helpless (a dominant emotion of sadness), as shown in the script for depression in Table 7.5. Fischer and Ayoub have also analyzed working models in maltreated children, which

TABLE 7.5 Core Conflictual Relationship Script for Depression

Wish or concern: A person wishes to be accepted, loved, and understood in a close relationship.

Other's response: Someone else who potentially could be in a close relationship with the person rejects or opposes him or her even while intermittently showing some love and acceptance.

Self's response: The person reacts with depression, disappointment, and a sense of helplessness. The dominant emotion is sadness, accompanied by various other emotions in the sadness family.

Based on "The Only Clinical and Quantitative Study since Freud of the Preconditions for Recurrent Symptoms during Psychotherapy and Psychoanalysis" by L. Luborsky, 2001, *International Journal of Psychoanalysis, 82,* pp. 1133–1154; and *Understanding Transference: The CCRT Method,* by L. Luborsky and P. Crits-Christoph, 1990, New York: Basic Books.

are discussed in the section on Emotional Splitting and Dissociation.

Research on temperament shows a similar pattern to attachment: modest long-term stability from the school years through adulthood in several dimensions of temperament, especially introversion/inhibition and anxiety/neuroticism (Costa & McCrae, 1997; Kagan & Snidman, 2004). The most extensive research involves introversion/inhibition in which a person is wary of novel situations, especially new people; it contrasts with extroversion or outgoing social behavior. This dimension demonstrates moderate correlations from infancy through childhood and during adulthood, which includes moderate stability on average as well as clear evidence of changes in many children (just like attachment style).

Theories of attachment and temperament mostly posit persistent, one-way influences of emotions, shaping development along one emotion dimension. Structural analysis provides powerful tools for capturing these one-dimensional effects, as illustrated in Figures 7.6, 7.7, and 7.13. These tools also point the way to going beyond one dimension to examine dynamic, complex effects, which typify most of emotional development.

Dynamic Shifts of Positive/Negative Biases in Webs

The tools for dynamic structural analysis facilitate moving beyond one-emotion analyses to more differentiated, textured depictions of the organizing effects of emotions on development. Emotional development involves multiple emotions, and emotional biases shift in different situations and at different points in development. Children change their understandings of themselves and their social world, and families, communities, and life situations shift in values and expectations over time.

The pervasive positive bias in development related to self illustrates well the possibilities of a more dynamic, multidimensional analysis of affective biases. Positive and negative emotions act dynamically in development, pulling this way and that—not always in the same direction. In research on development of emotions in self-concepts and social relationships, for example, children have shown developmental shifts in their orientations toward positive and negative (Fischer & Ayoub, 1994; Hand, 1982). In one longitudinal study, 3-, 4-, and 5-year-olds told stories about themselves and other children in nice and mean social interactions, as in Figure 7.5 (Hencke, 1996): Most 3-year-olds showed the opposite of the positive bias in older children and adults—a clear negative bias. At age 3 stories about ME_{MEAN} were

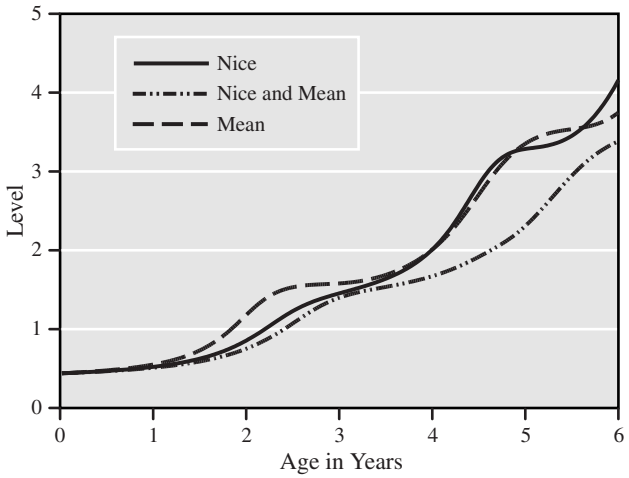


Figure 7.25 Growth functions showing a shifting bias from initial negative toward later positive interactions.

understood better than ME_{NICE} and preferred. As one 3-year-old said, "Can we do more of these mean stories? They're more fun!" Within a few years, however, the children's negative bias disappeared and was replaced by the usual positive bias, which gradually became stronger. This dynamic shift from a negative bias to a positive one is represented in the growth model in Figure 7.25.

Developmental Shifts in Emotions about Self in Family Roles

Such shifting affective biases are pervasive in development. In a general developmental principle, each new level brings with it specific emotional reactions and distortions, and many of these emotions change as children develop to higher levels. For example, the research literature illustrates transient emotional defensiveness in early development, based on children's developing (mis)understanding of themselves and their social roles. For the behavioral role of baby, ME_{BABY}, preschoolers show early skill at acting out the baby role in pretend play, even before the role of mother, ME_{MOTHER} (Pipp, Fischer, & Jennings, 1987). As they reach the age of 3 years or so (and firmly identify as *not a baby*), however, many of them become unable to act out the baby role, even though they are now capable of acting out many other simple roles such as mother, child, doctor, and patient (Watson, 1984). Other cases of emotional defensiveness affecting performance in 3-year-olds include African American children categorizing themselves as White even though they can accurately categorize other people as Black or White (Clark & Clark, 1958; Fischer,

Knight, et al., 1993; Spencer, Brookins, & Allen, 1985) and young boys categorizing themselves as large (old) even though they can accurately categorize other children as small or large (Edwards, 1984). These biases seem to be early versions of the self-promoting bias that pervades human mental life and that changes in form as children's understandings and emotions grow (Greenwald et al., 2002).

Generally, children participate in the social relationships and roles that they experience in their lives, and various emotional implications of those relationships and roles emerge for them depending on their skill development. A classic example of such emotion effects is the Oedipus conflict, which Freud (1955) originally described but which has been the subject of little developmental research except for global cultural comparisons (Spiro, 1993). According to Freud, preschool children develop a desire to replace their same-sex parent in order to assume a romantic relationship with their opposite-sex parent. Freud built a large theoretical edifice around this emotional conflict in the nuclear family.

Watson and Getz (1990), who studied the Oedipal phenomena empirically in middle-class White U.S. families, found that children did show a surge of Oedipus-type emotionally organized behaviors from 3 to 4 years of age. For example, one 4-year-old girl said to her father, "Daddy, kiss me a hundred times more than you kiss Mommy." Oedipal behaviors then declined sharply at ages 5 and 6. The researchers explained the emergence and decline of Oedipal activities, in terms of not castration anxiety and similar violent fantasies that Freud attributed to young children, but developing understanding and emotions about family roles. The first understanding of the special love *relationship* defined by husband and wife roles emerges at age 4 when children map representations of mother and father into a relationship concept. This new skill leads them to want to assume the special role with their opposite-sex parent. As a girl named Johanna comes to understand the special roles of her parents (Jane and Walter) as partners,

$$\left[JANE_{MOTHER} \text{ —— } WALTER_{FATHER} \right] \qquad (4)$$

she wants to take on the role of her mother so that she can have the special love relationship with her father:

$$\left[JOHANNA_{MOTHER} \text{ —— } WALTER_{FATHER} \right] \qquad (5)$$

That is why she says things like, "Daddy, kiss me a hundred times more than you kiss Mommy."

This understanding globs together or condenses parental and spousal roles, treating the mother role as including the wife role and the father role as including the husband role. When the roles are differentiated and coordinated in a representational system, children see that they cannot assume the parental role for themselves (becoming their own father or mother), and they see other limitations as well such as that they are too young to marry their parent and that people are not supposed to marry other family members. This emerging, more complete understanding of role relationships in the family leads the child mostly to lose the wish to replace the same-sex parent, unless there are role confusions in the family such as incest (Fischer & Watson, 2001). She comes to understand the intersection of spousal and parental roles in practice in the family:

$$\left[JANE^{WIFE}_{MOTHER} \longleftrightarrow WALTER^{HUSBAND}_{FATHER} \right] \qquad (6)$$

Development of Emotional Splitting and Dissociation

Emotions powerfully shape development, and one of the most pervasive effects on developmental pathways is emotional splitting, in which people routinely split positive and negative into separate elements that can be combined (Ayoub et al., 2003; Fischer & Ayoub, 1994; Harter, 1999). The positively biased web for development of nice and mean in Figure 7.6 illustrates one instance of splitting: Two-year-old children commonly split self and other, representing themselves as nice and someone else as mean, ME_{NICE} and YOU_{MEAN}. They have difficulty putting the two opposite representations together to see that each person (self and other) can be both nice and mean.

With time, children develop from splitting toward integration in particular domains. By the grade school years, most children become able to coordinate affects across the positive-negative split in many social situations, as when they represent themselves and other people as simultaneously nice and mean in the stories at steps 6 and 7 in Figures 7.5 and 7.6. For example, in one story, Jason comes up to Seth on the playground, hits him on the arm, and says, "I want to be your friend. Let's play" (a combination of mean and nice actions).

Seth responds with appropriate reciprocal nice and mean actions: "I would like to be your friend, but I don't play with kids who hit me." Younger children who are asked to act out or explain stories of this kind commonly split them into two separate stories, one about being nice and a second about being mean. The skills in the middle column (Nice & Mean) in the webs involve various steps in integration across the positive-negative split.

Splitting is a special case of the more general category of dissociation in which activities are separated even though they should be coordinated by some external criterion. Emotional splitting involves separation along the positive-negative dimension, or more generally, between affective opposites (e.g., smart and dumb, grown up and child). Dissociation typically refers to a stronger separation of elements along dimension(s) besides positive-negative evaluation. The mind is naturally fractionated, as represented by the separate strands in developmental webs. Consequently, splitting and dissociation are pervasive in human activity.

The terms *dissociation* and *splitting* are often used narrowly to refer to motivated separation in psychopathology such as dissociating the self into multiple personalities, or splitting family and friends into good and bad people (Breuer & Freud, 1955; Putnam, 1997). Yet splitting and dissociation occur normally and routinely as a result of lack of coordination of skills or experiences that are naturally separate (Feffer, 1982; Fischer & Ayoub, 1994). There need be no pathology. People normally split their world into good and bad, smart and dumb, or us and them. In many instances, they strongly dissociate themselves from people, beliefs, and feelings that they disapprove of. Experimental research has established clearly that various forms of active dissociation occur normally, especially during dreaming, hypnosis, and extreme religious experiences (Foulkes, 1982; Greenwald et al., 2002; Hilgard, 1977). Splitting and dissociation are normal parts of human development.

Tools for dynamic analysis of development provide insights into both normal and pathological splitting and dissociation. The development of positive and negative shows natural positive-negative splitting, as shown in the nice/mean webs in Figures 7.5 and 7.6 and the SiR Interview in Figure 7.13. In severe emotional trauma, splitting and dissociation are magnified and play an important role in adaptation to the trauma.

Children subject to severe abuse frequently cultivate skills of dissociation to adapt to their horrendous situations (Putnam, 1997; Terr, 1991). For example, 8-year-old Shirley used dissociation to cope with her father's abuse of her (Canadian Broadcasting Corporation, 1990). Shirley's father repeatedly raped her in her bed in the basement of their home, and he beat her up if she ever resisted his advances. To cope during the rape, she concentrated on a small hole in the wall above her bed, dissociating from her body and feeling that she put herself into the hole. Inside the hole, she could get through the trauma without major distress and without angering her violent father. One day, her father raped her upstairs in the main house instead of in the basement. Without the hole in the wall to support her dissociation, she began screaming and fighting her father. He lost his temper, knocked her unconscious, and then continued with the rape. (Although the father was never arrested for his crimes, Shirley did eventually find help, and she became a competent adult crusading to stop child abuse.)

In a situation like Shirley's, dissociation was an adaptive achievement in which she created a coordination to actively dissociate, building skills to keep herself from experiencing the full pain of the trauma. By 4 to 6 years of age, children first demonstrate active dissociation of a few components from one another, as when Shirley put herself in the hole in the wall (Fischer & Ayoub, 1994):

$$\left[ME\text{-}SHIRLEY_{IN\ HOLE} \dashv\!\!\blacksquare\!\!\vdash SHE\text{-}SHIRLEY_{RAPED} \right] \quad (7)$$

The block on the line relating the two Shirley roles denotes that the coordination is dissociative. With development, people can construct more complex, sophisticated dissociative coordination, actively separating multiple components.

Although research is still young on the developmental pathways of abused children, available data guide an initial sketch of the pathways, including disorganized attachment—(type D) described earlier. In severely abused or neglected children, the organization of development along the positive-negative dimension is powerfully affected. For many maltreated children, the normal positive bias in representations disappears at a young age to be replaced by the opposite—a negative bias, in which the tilt in Figures 7.6 and 7.7 is shifted to the negative side. Instead of focusing their representations of self and important relationships toward the positive, many maltreated children characterize the self in

pervasively negative terms, endlessly acting out and talking about negative events and interactions.

The findings from one study demonstrate how powerful this reversal can be. It creates an alternative developmental pathway based on a negative self bias. A group of adolescent girls hospitalized for depression and conduct disorder (acting out) described themselves in the SiR Interview (Figure 7.13), which was designed to produce rich self-descriptions (Calverley, Fischer, & Ayoub, 1994; Fischer et al., 1997). In one part of the interview, they indicated the importance of various self-characterizations, and in another part they indicated whether the self-characterizations were positive or negative. Instead of the usual positive bias shown by adolescents in this interview, the girls who had experienced severe and prolonged sexual abuse showed a pervasive negative bias in their feelings about themselves in relationships, as shown in Figure 7.26. Depressed girls in the same hospital who had not been sexually abused showed no negative bias but a clear positive bias instead. Contrary to many clinical claims, the abused girls did not function at low developmental levels in their self-representations; they produced levels comparable to those of the nonabused girls and to adolescents of similar ages in other populations. Their self-descriptions were negative, but not primitive. The abused girls were developing along a distinctive pathway, not failing to develop.

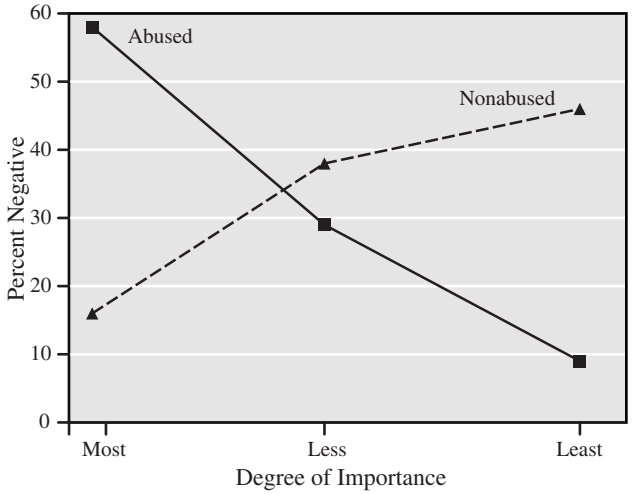


Figure 7.26 Importance of negative self-representations in abused and nonabused depressed adolescent girls. *Source:* From "Complex Splitting of Self-Representations in Sexually Abused Adolescent Girls," by R. Calverley, K. W. Fischer, and C. Ayoub, 1994, *Development and Psychopathology, 6,* pp. 195–213.

These traumatic environments produce distinct developmental pathways that are powerfully shaped by the experiences of abuse and trauma (Ayoub & Fischer, in press). Children growing up in such environments often produce remarkably sophisticated dissociation, which like Shirley's dissociation, demonstrate great developmental complexity. Figure 7.27 describes an early developmental pathway for a boy named John, who was growing up in a situation of hidden family violence where there is a rigid, socially maintained dissociation between public good and private violent worlds. In private, his father treated him tyrannically, abusing him physically whenever he disobeyed. In public, his father treated him as a good child whom he was proud of. In general, the parents maintained a consistent public image as good citizens and neighbors and model members of the community, but at home they were violent and abusive.

As John developed working models of close relationships, he constructed his own version of the private-public dissociation that his family maintained. He built increasingly complex and generalized representations of tyrant-victim relationships in private and model-family relationships in public (Ayoub et al., 2003; Fischer & Ayoub, 1994). Figure 7.27 illustrates three major levels in this development between 2 and 7 years of age for the first three levels of the representational tier (Rp1 to Rp3). At the first level, John represented himself in his private and public roles with his father, but did not maintain a firm dissociation between the two (as indicated by the permeable line dividing the domains). At the second level, he built role relationships, connecting his own and his father's roles and dissociating public and private more firmly. The third level brought a

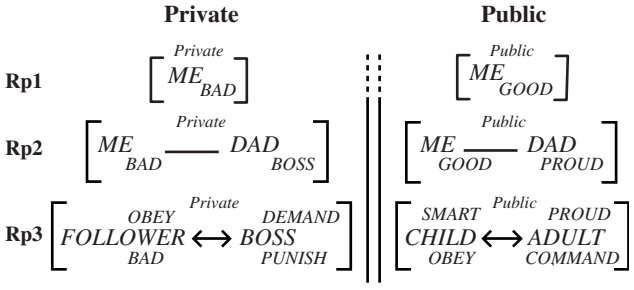


Figure 7.27 Development of dissociated representations (Rp) of private and public relationships in hidden family violence. The double line between columns indicates dissociation of the private and public pathways.

clear generalization of those roles beyond his relationship with his father—relationships with other adults and children.

These results do *not* mean that only abused or traumatized children show emotional splitting and dissociation. These are normal processes that everyone shows under many circumstances. Abuse produces different developmental pathways in which the person's working models of relationships are organized powerfully by the abuse, yielding characteristics such as a negative bias and a sharp dissociation between public good and private violent relationships. Tools for dynamic analyses of development provide ways of detecting these distinctive pathways and avoiding the common error of characterizing complex forms of dissociation and splitting as developmentally primitive.

In summary, emotions act as biasing forces that shape development along particular pathways, including normative emotional splitting of positive and negative in representations of self and others. When children have severe emotional experiences such as abuse, their emotional reactions contribute to shaping their development along unusual pathways that are built on their emotion-laden relationships. Developing understandings affect emotional reactions through changing appraisals, which lead to consequences at certain points in development, such as emotional reactions in 4-year-olds similar to those that Freud attributed to the Oedipus conflict. Emotions thus constitute a prime example of the usefulness of dynamic structural concepts and methods for analyzing how different components work jointly to produce development.

Emotion and cognition work together, affecting each other's development so extensively that they are difficult to separate. In the big picture of macrodevelopment, many of the large developmental reorganizations occur concurrently for emotion and cognition. Through dynamic structural analysis, it has become possible to build the first detailed models of how these changes in emotion and cognition relate to brain development.

JOINING NATURE AND NURTURE: GROWTH CYCLES OF PSYCHOLOGICAL AND BRAIN ACTIVITY

The dynamic structural framework provides powerful tools for detecting regularities in development. Without these tools, regularities are often swamped by the variability of human activity. Dynamic analysis has been especially useful in dealing with variability in the search for relations between psychological and brain development, producing the first specific models of relations between brain and activity in development—hypothesized growth cycles linking developmental levels of cognition and emotion with growth of cortical functioning (Fischer & Rose, 1994; Thatcher, 1994). Using dynamic analysis, researchers have uncovered rich new findings and built the first detailed models of relations between brain and psychological development.

Most developmental research fails to deal with the facts of variability, but neglecting those facts is especially perilous for research on relations between brain and behavior. Development has many different shapes! Some activities and brain functions show continuous growth, while others show various discontinuities. Research on relations between brain and behavior needs to start with analyzing different growth patterns to find relations amid all the variability. The varying shapes provide tools for unpacking growth processes in brain and activity. If the variations are left out, the research is doomed to become swamped by the combined variability in brain and behavior development.

Epigenesis of Action, Feeling, Thought, and Brain

Today, scientists assume that growth of the brain relates closely to growth of action, thought, and emotion; yet the empirical basis for this belief remains limited because there are few studies that directly assess relations of brain and behavior development. In a few narrow domains, research on neural systems has uncovered close relations between particular brain components and developing behaviors, especially for the visual system (Hubel & Wiesel, 1977) and some aspects of language (Deacon, 1997). For connections between brain changes and development of action, thought, and emotion more generally, speculation is rampant, but evidence is missing.

Happily, research is beginning to change this situation, with new epigenetic analyses of the dynamics of brain-behavior development. Research shows complex patterns of nonlinear, dynamic growth instead of monotonic growth (Fischer & Rose, 1994; Rakic, Bourgeois, Eckenhoff, Zecevic, & Goldman-Rakic, 1986; Shultz, 2003; Thatcher, 1994; Thelen & Smith, Chapter 6, this *Handbook,* this volume; van Geert, 1998). The tools for

dynamic growth analysis open ways to illuminate the epigenesis of brain-behavior relations.

Between behavior and brain, there are important commonalities that facilitate the search for regularities, including patterns of epigenetic change. Epigenesis is development through qualitative changes like those from egg and sperm to fertilized cell, embryo, newborn infant, and, eventually, adult human being. After the historical debate about the nature of embryological development was settled in favor of epigenesis, as opposed to quantitative growth of a preformed human being, the epigenetic conception was extended not only to brain development but also to cognitive and emotional development (Erikson, 1963; Hall, 1904; Piaget, 1983; Werner, 1948). The analysis of growth functions suggests a straightforward correspondence between patterns of epigenesis in brain and behavior.

From a dynamic perspective, each structure in epigenesis emerges as a result of the self-organizing activity of previously developed systems through coordination of component processes, as described in the earlier section on Dynamic Structure. Such systems are hierarchically organized, with the component systems fulfilling both separate functions and functions that are part of the larger system. The key for developmental science is to unpack the specific principles and cycles in this epigenesis that illuminate the development of brain, action, thought, and emotion.

The growth cycles of brain and behavior involve a long sequence of epigenetic coordinations, extending from before birth well into adulthood. Cognitive and emotional development combine with brain development in a collaboration connecting neural networks with actions, feelings, and thoughts. There is no separation of nature and nurture, biology and environment, or brain and behavior but only a collaborative coordination between them. "Between nature and nurture stands the human agent whose unique integrative capacities drive the epigenesis of intelligence and organize biological and environmental contributions to the process" (Bidell & Fischer, 1996, p. 236).

Principles for Understanding Growth Patterns of Brain and Behavior

Analyzed in terms of dynamics of growth and especially discontinuities, developmental curves for many characteristics of brain and behavior show remarkable similarities that seem to relate to their common foundation in hierarchical, epigenetic growth shared by neural networks and optimal levels in behavior. Investigation of these common growth patterns in both psychological and brain activity gives evidence for two recurring growth cycles. We first explicate five principles described by Fischer and Rose (1996) to describe their model of brain/behavior growth cycles, which was strongly influenced by the work of Thatcher (1994) and van Geert (1991, 1994).

Both brain activity and optimal cognitive functioning show nonlinear dynamic growth, often developing in fits and starts, which is characteristic of human physical growth in general (Lampl & Johnson, 1998). Growth speeds up and then slows down, demonstrating spurts, plateaus, drops, and other discontinuous shifts in growth patterns. For some types of growth, the fits and starts are systematic, and for others they are disorderly, showing the variability that is typical of dynamic systems affected by many different factors, as illustrated in Figure 7.11. For certain properties of brain activity and for the optimal levels of cognition and emotion, the fits and starts are systematic and form clusters of discontinuities at particular age intervals. Understanding the systematicity, however, requires understanding the variability. The principles for the dynamic structural framework range from clusters of discontinuities to processes of variability and regularity in growth functions.

> *Principle 1: Clusters of Discontinuities in Growth of Brain and Behavior.* Development of both brain activity and psychological activity moves through a series of clusters of discontinuities (spurts, drops, and other forms of abrupt change) indicating levels of reorganization of control systems for action, thought, and feeling. An important focus for analyzing discontinuities is the leading edge of change such as the onset and peak of a spurt.

A broad array of evidence indicates a sequence of discontinuities in development of brain and behavior marking a succession of levels and reflecting basic growth processes, as was discussed in the section on the Common Ruler for Skill Development. The growth patterns for different variables are not identical but variable, showing the normal diversity of dynamic systems. At the same time, the processes of development (what Piaget, 1985, called "equilibration") produce important regularities across growth curves, as shown by the dynamic model for linked growers in Figure 7.15.

Principle 2: Concurrence of Independent Growers. Developing behaviors and brain activities that are mostly independent (belonging to different domains or strands and localized in different brain regions) commonly show discontinuities that are approximately concurrent. The dynamics of the person's growing control systems produce concurrent changes across a number of independent psychological and brain activities.

In the web for multiple developing domains, discontinuities occur in concurrent clusters across domains, as marked by the clusters for optimal level in Figure 7.15 and the emergence zones in the web in Figure 7.17. Note, however, that the same growth curves also show relative independence of the growers. When small portions of the curves are viewed up close, as in Figure 7.27, the same growers that show clustering in Figure 7.15 are evidently independent, because the short-term concurrence across growers is not strong. Most developmental research takes this up-close, short-term view, instead of the distanced, long-term perspective. Clusters of discontinuities coexist with relatively independent growth in dynamic systems, with the (weak) linkages among growers often evident only in the long-term perspective.

A frequent error in the study of development is to assume that clusters of spurts or other discontinuities reflect a single coherent mechanism such as growth in a memory module that controls all the growers in common. Many traditional cognitive theories posit such a single mechanism of working memory or short-term memory, which acts as a bottleneck limiting development in all domains (e.g., Case, 1985; Halford, 1982; Pascual-Leone, 1970). Such single-process explanations do not fit the evidence. Growers that cluster can be independent of each other, with the clusters produced by dynamic regulatory processes, as in Figure 7.15. For example, synaptic densities in diverse cortical regions in infant rhesus monkeys develop through approximately concurrent spurts and drops, even though the regions are clearly separate and function mostly independently (Bourgeois & Rakic, 1993; Rakic et al., 1986).

Because of the many ways that a dynamic system can produce concurrent discontinuities, analysis of the processes underlying concurrence requires research designs for analyzing growth processes and dynamic variability. Growth must be investigated under diverse conditions that incorporate assessment of variability, and growth processes should be represented in explicit dynamic growth models (Fischer & Kennedy, 1997; Thelen & Smith, Chapter 6, this *Handbook,* this volume; van Geert, 1991, 1998). For investigations of relations between brain and behavior, these designs should include analyses of domain specificity of behavior and localization of brain function. Contrary to common assumptions, concurrence does not at all contradict domain specificity or localization.

Principle 3: Domain Specificity of Activities and Localization of Brain Functions. Relations between growers in various domains and brain regions can be analyzed through comparison of individual growth functions for those domains and brain regions. The complex shapes of the growth functions provide a tool for determining which growth functions vary together and thus which skills and brain regions grow together.

For example, many activities in distinct domains exhibit concurrent growth at approximately 8 months of age, including spatial skills such as search and locomotion, verbal skills such as imitation and intonation, and social skills such as recognizing familiar caregivers and striving to stay near them—shown by separation and stranger distress (Ainsworth et al., 1978; Bertenthal, Campos, & Kermoian, 1994; Campos et al., 2000; Uzgiris & Hunt, 1987). Many infants start to search effectively for toys or cookies hidden successively under different covers, imitate simple intonation contours and syllables that they hear spoken by their caregivers, and show consistent distress at their mother departing and at strangers appearing. These three different sets of activities belong to distinct domains and involve distinct cortical networks. They show globally parallel changes, but determination of whether they are tightly connected requires dynamic analysis of growth patterns.

Growth functions can differentiate which of these activities go together with development of specific brain regions. Bell and Fox have compared growth functions for these behaviors with those for cortical activity as measured by the electroencephalogram (EEG; Bell, 1998, 2001; Bell & Fox, 1992, 1994). Individual infants showed strongly overlapping concurrence for some domains and regions, but only loose and imprecise concurrence for others. For example, infants who demonstrated a spurt in search skills between 8 and 12 months produced a concurrent spurt in EEG activity (power) in the frontal cortex, but not elsewhere; they also showed growing connections between frontal and occipital/parietal

cortex as measured by EEG coherence. In contrast, infants who did not demonstrate clear spurts in search skills produced no growth spurts for cortical activity.

By relating dynamic variations in growth functions, researchers can move beyond the difficulties of comparison across domains and regions. They can use similarities in growth functions to analyze development of brain-behavior relations, detecting when concurrent discontinuities mesh across behaviors and cortical activities, and when they do not mesh. Clusters of discontinuities seem to reflect emergence of new organizations of brain and behavior, new action control systems linked to neural networks. Discontinuities in EEG activity, cortical connectivity, and psychological activity demonstrate concurrence and reflect the emergence of new control systems and neural networks.

Principle 4: Emergence of Neural Networks and Action Control Systems. With each developmental level, a new kind of control system for action emerges, supported by growth of a new type of neural network linking several brain regions and built on lower-level skills. Across different brain regions and skill domains, similar (independent) networks and control systems emerge concurrently. They produce clusters of discontinuities in characteristics of cortical activity and optimal level. Careful analysis of growth functions allows detection of correspondences beyond global concurrence between cortical regions and skills.

After emergence, the new systems undergo a lengthy period of consolidation during which they are tuned gradually to form efficient behavioral-neural control systems. Eventually, another new type of control system starts to grow, and another developmental level and cluster of discontinuities begins. In this way, the growth cycle creates the hierarchy of psychological and brain development.

Principle 5: Cycles of Discontinuities Forming Levels and Tiers. The development of a series of increasingly complex networks and control systems forms two dynamic cycles, one forming developmental levels, and the other, higher-order one, grouping levels into tiers and thus forming a cycle of cycles.

The cycles comprise a cascade of growth changes that move through brain areas and psychological domains systematically and cyclically—a growth process systematically altering neural networks as it moves. There are no all-or-none changes, occurring everywhere at once as suggested by classical conceptions of stage. The cycles may involve a number of different neural processes such as synaptic growth and pruning across cortical regions (Huttenlocher, 2002; Rakic et al., 1986), dendritic growth (Marrs, Green, & Dailey, 2001; Scheibel, Conrad, Perdue, & Wechsler, 1990), the formation of myelin to insulate neurons and thus produce faster neural impulses and improved coordination (Benes, 1994; Yakovlev & Lecours, 1967), and diverse other processes that improve communication among brain regions.

Cycles of Reorganization in Development

These principles specify a model for growth along the developmental scale for psychological activity in relation to brain activity—10 levels between 3 months and 25 years of age, as shown in Figure 7.3 for optimal levels. (An additional three levels are hypothesized for the first 3 months of life, Fischer & Hogan, 1989.) The levels on the scale are supported by an array of evidence of discontinuities and growth cycles for both behavior (action, thought, and feeling) and brain (anatomical growth and cortical activity). The ages for appearance of each level are highly variable, except under optimal assessment conditions. At the age of emergence, most people can first control several skills at the new level of complexity, and by hypothesis they are growing a new kind of neural network in diverse brain regions, evidenced by clusters of discontinuities in neural activity. Even under optimal conditions, however, exact age of emergence varies across individuals and domains (see Figure 7.28).

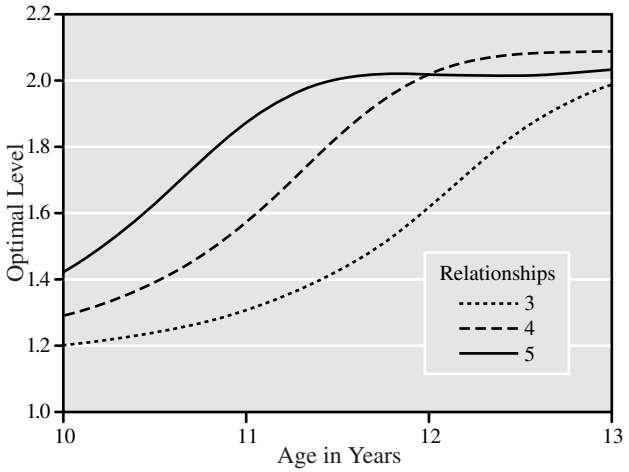


Figure 7.28 Close-up view of optimal level for three growers in the model of Self-in-Relationships (Figure 7.15).

Development takes place in three different grains of detail—step, level, and tier. At the finest grain at which developmental ordering can be detected, skills form a sequence of microdevelopmental *steps,* separated by relatively short time intervals and small differences in complexity. In dynamic skill theory, the steps are predicted and explained by a set of rules for transforming skills via coordination and differentiation such as the shift of focus rule discussed in the section on Microdevelopment. Most steps are simply points along a strand in a developmental web of skill construction and do not involve discontinuities.

The intermediate grain of detail is developmental *level,* with each level emerging in a cluster of discontinuities in behavior and brain activity, marking emergence of a new kind of control system and network, and therefore a capacity to construct a new kind of skill. Assessment of fine-grained steps greatly facilitates detection of levels by providing detailed rulers and clocks for amount and speed of change, as described in the section on Methodology.

At the broadest grain, levels form the cycles of reorganization called *tiers,* defined by a cycle of four increasingly complex levels, as shown in Figure 7.3. With the start of a tier, skills are simplified by being reorganized into a new unit of activity: actions, representations, or abstractions, respectively (as well as reflexes, by hypothesis, in early infancy). Skills within a tier grow through four levels, from single units to mappings to systems and finally to systems of systems, which initiates the next tier. Development of a new tier brings an unusually strong form of discontinuity, producing radical alterations in brain and psychological activity. For example, late in the second year, children move into the representational tier, beginning to show complex language, independent agency (as in representing ME_{NICE} and YOU_{MEAN}), and a plethora of other radical behavioral changes, as well as major spurts in frontal and occipital-parietal activity. Likewise, at 10 to 12 years, children combine multiple concrete representations to form the first abstractions and begin another new tier.

A new tier requires melding together complex systems to forge a new unit—an achievement that necessitates neural glue to cement the components together. We hypothesize that the prefrontal cortex provides much of this glue, in consonance with the general functions of frontal cortex (Damasio, 1994; Gray, Braver, & Raichle, 2002; Thatcher, 1994).

Hierarchical Growth of Action and Thought

Hierarchical skill growth has a characteristic pattern of spurts and plateaus (sometimes drops), illustrated for the growth model in Figure 7.15. Research on cognitive development commonly shows this specific pattern of growth, as illustrated for a study of reflective judgment in Figure 7.29 (Fischer & Pruyne, 2002; K. Kitchener et al., 1993). The Reflective Judgment Interview, devised by K. Kitchener and King (1990), elicits arguments about knowledge for complex dilemmas such as determining the truth based on conflicting news reports. In an optimal-level assessment, students showed general increases in level between 14 and 28 years, with spurts centered at approximately 16, 20, and 25 years of age. Many other findings, such as the evidence for discontinuities in the development of self-in-relationships for Korean adolescents in Figure 7.8, manifest similar patterns for optimal conditions.

Besides hierarchical growth, correlations among behaviors also show discontinuities with the emergence of skill levels. For example, longitudinal analysis of infant

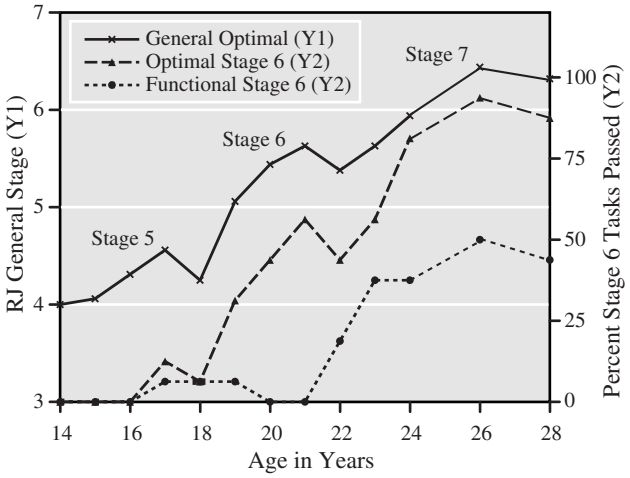


Figure 7.29 Development of reflective judgment: Optimal and functional levels. Performance at optimal level spurts on emergence of Stages 5, 6, and 7 of reflective judgment, but functional level performance shows slower, more gradual increase. The top line (solid) shows the general score for reflective judgment across all tasks. The two dotted lines show percentage of correct performance for the subset of tasks assessing Stage 6, which is the beginning of true reflective thinking. The upper dotted line shows optimal level for Stage 6, and the lower line shows functional level. *Source:* From "Developmental Range of Reflective Judgment: The Effect of Contextual Support and Practice on Developmental Stage," by K. S. Kitchener, C. L. Lynch, K. W. Fischer and P. K. Wood, 1993, *Developmental Psychology, 29,* pp. 893–906.

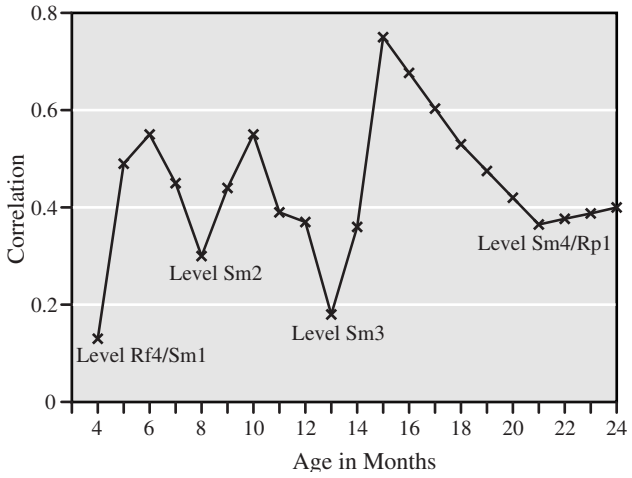


Figure 7.30 Changes in stability of infant behavior scores for girls in the Berkeley Growth Study. *Source:* From "Transitions in Early Mental Development," by R. B. McCall, D. H. Eichorn, and P. S. Hogarty, 1977, *Monographs of the Society for Research in Child Development, 42*(3, Serial No. 171).

test performance at three ages in infancy from the Berkeley Growth Study showed sharp drops in correlations among test items at approximately 8, 13, and 21 months of age, as well as a rise from low stability at 4 months, as shown in Figure 7.30 (McCall et al., 1977). These changes match other evidence for discontinuities at similar ages (for instance, Fischer & Hogan, 1989; Ruhland & van Geert, 1998; Uzgiris & Hunt, 1987).

The clear evidence for discontinuities must be understood dynamically: Most activities do not exhibit clear discontinuities at these ages because level varies dynamically with optimal support, emotional state, task demands, and many other factors. Discontinuities occur consistently only in activities that at a minimum (a) increase in complexity with development and (b) are assessed under conditions that support optimal performance (the person's optimal level). Subtler measures of discontinuity tend to show gaps in scales at the same points even without high support, but the relations with age are then highly variable (Dawson-Tunik, 2004).

Growth Cycles in Brain

One of the most remarkable characteristics of the evidence for brain development is the similarity in growth curves with cognitive development. Brain growth shows the same series of discontinuities, fitting the hierarchical growth curve for psychological development. Many of the data have been reviewed by Fischer and Rose (1994) and Thatcher (1994), especially for cortical activity, synaptic density, and head growth. They find that the majority of studies provide globally supportive evidence, but are limited by age sampling that is too infrequent to provide precise estimates of growth functions. The studies with more frequent sampling of age show clear, strong cyclicity of brain growth, with a series of discontinuities at specific age periods, listed in Figure 7.3. Here are a few strong examples involving the EEG, which measures electrical activity in the cortex. The measures showing the clearest developmental change involve the amount of energy in electrical waves, which is called power. Relative power is assessed for a region and wave band by dividing its energy by another measure of energy such as the total energy in the EEG.

In infancy, discontinuities in EEG power appear at ages similar to those for psychological development—approximately 3 to 4, 6 to 8, 11 to 13 months, and 2 years (Hagne, Persson, Magnusson, & Petersen, 1973). For example, a study of relative power for occipital EEG in Japanese infants found spurts at approximately 4, 8, and 12 months, as shown in Figure 7.31 (Mizuno et al., 1970). During childhood and adolescence discontinuities cluster at approximately 2, 4, 7, 11, 15, and 20

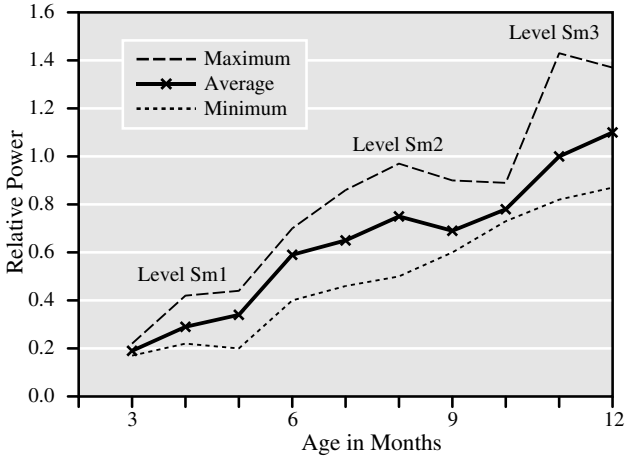


Figure 7.31 Development of relative power in occipital EEG in Japanese infants. Relative power is the ratio of power for the band from 7.17 to 10.3 Hz to power for the band from 2.4 to 3.46 Hz. *Source:* From "Maturation of Patterns of EEG: Basic Waves of Healthy Infants under 12 Months of Age," by T. Mizuno et al., 1970, *Tohoku Journal of Experimental Medicine, 102,* pp. 91–98.

years (Somsen, van 't Klooster, van der Molen, van Leeuwen, & Licht, 1997; Thatcher, 1994). Figure 7.32 portrays development of relative power from a classic Swedish study, with spurts at approximately 2, 4, 8, 12, 15, and 19 years (Hudspeth & Pribram, 1992; John, 1977; Matousek & Petersén, 1973).

Thatcher's (1994) massive study of development of EEG coherence illustrates not only the existence of discontinuities at appropriate age regions, but also other shapes for growth curves with different forms of discontinuity. Coherence is a measure of correlation between wave patterns in different cortical regions, so that high coherence indicates that two regions have similar EEG wave patterns and are therefore connected and communicating with each other. With development, coherence for any pair of EEG sites typically oscillates up and down, and these oscillations show growth cycles, moving through cortical regions in a regular pattern. In addition, the oscillations evidence discontinuities that relate to developmental levels, in which the oscillation pattern abruptly shifts to a different period. At approximately 4, 6, and 10 years, the period of oscillation shifts dramatically, and the relations of patterns of oscillation across brain regions shift from in-phase to out-of-phase, or vice versa. These patterns provide powerful clues for analyzing development of brain-behavior relations.

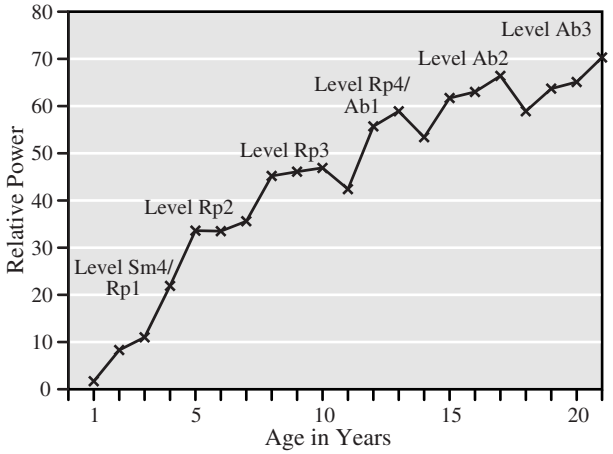


Figure 7.32 Development of relative power in alpha EEG in occipital-parietal (O-P) area in Swedish children and adolescents. Relative power is the amplitude in microvolts of absolute energy in the alpha band divided by the sum of amplitudes in all bands. *Sources:* From *Functional Neuroscience: Vol. 2. Neurometrics,* by E. R. John, 1977, Hillsdale, NJ: Erlbaum; and "Frequency Analysis of the EEG in Normal Children and Adolescents" (pp. 75–102), by M. Matousek and I. Petersén, in *Automation of Clinical Electroencephalography,* P. Kellaway and I. Petersén (Eds.), 1973, New York: Raven Press.

The cycles of coherence suggest not only a series of discontinuities but a growth cycle in connectivity among cortical regions for each level (Fischer & Rose, 1994; Immordino-Yang & Fischer, in press; Thatcher, 1994). Surges and drops in connectivity as measured by EEG coherence cycle through brain regions in repetitive patterns. The leading edge of growth moves in a systematic pattern around the cortex, showing one full cycle for each level, as diagramed in Figure 7.33. The connections are typically led by the frontal cortex, beginning with long-distance connections between frontal and occipital regions for both hemispheres. Then growth moves systematically around the cortex, extending through the right hemisphere and then through the left. For the right hemisphere, growth begins with long-distance, global connections and then contracts toward more local ones. In the left hemisphere, growth begins with more local connections and expands toward more distant ones. Growth moves systematically through cortical areas until it encompasses networks everywhere in the cortex. The cycle thus explains how independent networks manifest concurrent growth spurts in a general age period.

There is much exciting research to be done to test out these models of brain-behavior development and their implications for relations between brain change and behavioral development. It is important to remember, however, that they are dynamic systems, which means that they will not follow uniform shapes for growth. They will show variations from the simplified growth functions in Figure 7.15 and various figures in this chapter. They will also show important variations across individuals, tasks, states, and contexts, as predicted by the growth processes in the dynamic model.

CONCLUSION: DYNAMICS OF STABILITY AND VARIABILITY IN DEVELOPMENT

The proper focus for understanding human action, thought, and feeling is the organization of human activities and their many variable shapes. Activities form coherent patterns—dynamically varying structures that people actively construct at every moment, using not only their brains but also their bodies; the objects and people around them; and the roles, norms, and values of their culture. Dynamic structuralism analyzes human activities in all their complexity, combining concepts

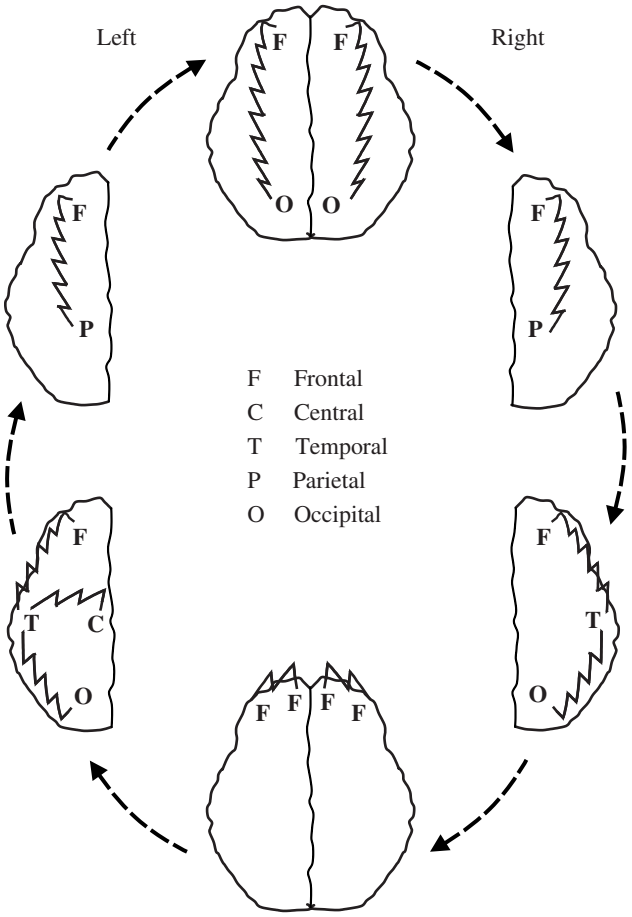


Figure 7.33 A cycle of growth of cortical connections for each level of skill development. *Note:* Jagged-line connections mark the leading edge of growth of coherence. Growth continues for each connection at other times as well. Connections between the middle and back of the left hemisphere are more prevalent than similar connections for the right hemisphere, and the temporal-central connection for the left hemisphere is shown as an example of that difference. *Sources:* From "Dynamic Growth Cycles of Brain and Cognitive Development" (pp. 263–279), by K. W. Fischer and S. P. Rose, in *Developmental Neuroimaging: Mapping the Development of Brain and Behavior,* R. Thatcher, G. R. Lyon, J. Rumsey, & N. Krasnegor (Eds.), 1996, New York: Academic Press; and "Cyclic Cortical Reorganization: Origins of Human Cognitive Development" (pp. 232–266), by R. W. Thatcher, in *Human Behavior and the Developing Brain,* G. Dawson & K. W. Fischer (Eds.), 1994, New York: Guilford Press.

and tools from nonlinear dynamics, biology, and cognitive science.

Explanation starts with people *in medias res,* and the structures of action, thought, and feeling are analyzed in the activities themselves, not in static logic, innate ideas, or internalized experiences. When a person acts, he or she functions on multiple developmental levels simultaneously, not just on a single level. As a person grows, his or her activities develop in many different shapes, not according to one or two basic patterns, as in linear change. Although the complexity of activities is great and their variability ranges widely, researchers can use powerful tools from dynamic systems and skill analysis to investigate the structures or organizations (patterns of components) and find the order in the variation.

The classic frameworks for analyzing structures have not acknowledged either the dynamics or the self-organizing properties of human action, feeling, and thought. They have relied on a static conception of structure as form, seeking simple "main effects" and "stabilities" instead of appreciating the power of analyzing variation. This static conception has reduced structures to one-dimensional forms with most of their components missing. It has reified psychological structures by treating them as logic, innate ideas, or sociocultural systems instead of placing them directly in the activities themselves. In its current guise, it forms the modern synthesis, in which nativist and empiricist positions are no longer in opposition but instead form a common framework based on Cartesian epistemology, reducing people to separate parts and analyzing them statically in separated nature and nurture.

Doing research within the dynamic structural framework leads to a different place. Analyzing the variability of human activities turns out to help illuminate the order within the variation; that is, designing research to analyze dynamics leads to new insights about the stabilities inside the variability. When development is analyzed as a constructive web instead of a linear ladder, clearly distinct pathways become evident for different people. For example, poor readers are not simply low on the ladder for development of reading, but they are developing their reading skills along more branched, less integrated pathways than normal readers. Abused children are not simply immature on the ladder for emotional stability and social reciprocity, but they have created distinct branched (often dissociated) pathways to cope with their abuse.

When multiple levels of skill are analyzed in each person, the debate about the existence of stages disappears. There is a common complexity scale for development and learning across domains, marked by discontinuous jumps at regular points in the scale, but it functions dynamically, not as a fixed ladder. Under optimal, highly supported conditions, people show jumps in performance

that act much like stages; but under ordinary, low-support conditions, the same people show no systematic stages, often progressing in smooth, monotonic growth. The complex shapes of growth curves under these various conditions provide important tools for analyzing relations among different components of human activity because the shapes can serve as clues for discovering such relations. Analysis of these shapes suggests relations between development of brain electrical activity and behavior, leading to new models of cycles of growth that relate brain activity to levels of skill development.

Recognition that individuals function at multiple simultaneous levels also allows the detection of strong microdevelopmental progressions reflecting people's construction of new skills and knowledge. It illuminates previously unrecognized mechanisms of transition such as co-occurrence of alternative strategies for approaching a task, repeated reconstruction of a skill to make it generalized, and construction of empty algebra-like shells to guide one's learning and facilitate building more complex skills. The common complexity scale in combination with growth models facilitates relating the short-term processes of microdevelopment to the long-term patterns of macrodevelopment.

When the collaborative nature of most activities is recognized and analyzed (instead of isolating people and studying them as separate "individuals"), important aspects of development become clarified. Processes of construction of skills can be straightforwardly detected in many situations because people interact with each other about their common activities with a task or problem. Many patterns of emotional development become clear because so much emotion arises from people's social relationships. Emotions such as shame and love are obviously social as well as biological, but even emotions such as fear, anger, sadness, and joy grow up in relationships and are defined by social scripts. Emotions act dynamically to shape or bias activity and development, and persistent, strong emotional experiences create distinctive developmental pathways such as richly textured shame concepts in China and elaborated negative self-in-relationship models in children who suffer abuse and trauma.

Scholars and researchers now have many new tools and concepts for analyzing the richness of human development, moving beyond Cartesian paradigms that reduce dynamic organization to static form and dichotomous analysis in nature versus nurture. Many examples are already in hand of how dynamic structural analysis helps illuminate phenomena that have been perplexing or that have gone undetected in prior paradigms. With the new dynamics, developmental scientists now have the possibility of capturing human nature in all its richness and variation instead of reducing people to one-dimensional stereotypes.

REFERENCES

Ainsworth, M. D., Blehar, M., Waters, E., & Wall, S. (1978). *Patterns of attachment: A psychological study of the strange situation.* Hillsdale, NJ: Erlbaum.

Anderson, J. R., Bothell, D., Byrne, M. D., Douglass, S., Lebiere, C., & Qin, Y. (2004). An integrated theory of the mind. *Psychological Review, 111,* 1036–1060.

Ayoub, C. C., & Fischer, K. W. (in press). Developmental pathways and intersections among domains of development. In K. McCartney & D. Phillips (Eds.), *Handbook of early child development.* Oxford, England: Blackwell.

Ayoub, C. C., Fischer, K. W., & O'Connor, E. E. (2003). Analyzing development of working models for disrupted attachments: The case of family violence. *Attachment and Human Development, 5,* 97–119.

Baillargeon, R. (1987). Object permanence in 3½- and 4½-month-old infants. *Developmental Psychology, 23,* 655–664.

Baillargeon, R. (1999). Young infants' expectations about hidden objects: A reply to three challenges. *Developmental Science, 2,* 115–132.

Baldwin, J. M. (1894). *Mental development in the child and the race.* New York: Macmillan.

Bandura, A. (1977). *Social learning theory.* Englewood Cliffs, NJ: Prentice-Hall.

Baron-Cohen, S. (1995). *Mindblindness: An essay on autism and theory of mind.* Cambridge, MA: MIT Press.

Beilin, H. (1983). The new functionalism and Piaget's program. In E. K. Scholnick (Ed.), *New trends in conceptual representation: Challenges to Piaget's theory?* (pp. 3–40). Hillsdale, NJ: Erlbaum.

Bell, M. A. (1998). The ontogeny of the EEG during infancy and childhood: Implications for cognitive development. In B. Garreau (Ed.), *Neuroimaging in child psychiatric disorders* (pp. 97–111). Berlin, Germany: Springer-Verlag.

Bell, M. A. (2001). Brain electrical activity associated with cognitive processing during a looking version of the A-not-B task. *Infancy, 2,* 311–330.

Bell, M. A., & Fox, N. A. (1992). The relations between frontal brain electrical activity and cognitive development during infancy. *Child Development, 63*(5), 1142–1163.

Bell, M. A., & Fox, N. A. (1994). Brain development over the first year of life: Relations between electroencephalographic frequency and coherence and cognitive and affective behaviors. In G. Dawson & K. W. Fischer (Eds.), *Human behavior and the developing brain* (pp. 314–345). New York: Guilford Press.

Benedict, R. (1946). *The chrysanthemum and the sword.* Boston: Houghton-Mifflin.

Benes, F. (1994). Development of the corticolimbic system. In G. Dawson & K. W. Fischer (Eds.), *Human behavior and the developing brain* (pp. 176–206). New York: Guilford Press.

Bertenthal, B. I., Campos, J. J., & Kermoian, R. (1994). An epigenetic perspective on the development of self-produced locomotion and its consequences. *Current Directions in Psychological Science, 3,* 140–145.

Bidell, T. R., & Fischer, K. W. (1992). Beyond the stage debate: Action, structure, and variability in Piagetian theory and research. In R. J. Sternberg & C. A. Berg (Eds.), *Intellectual development* (pp. 100–140). New York: Cambridge University Press.

Bidell, T. R., & Fischer, K. W. (1994). Developmental transitions in children's early on-line planning. In M. M. Haith, J. B. Benson, R. J. Roberts, Jr., & B. F. Pennington (Eds.), *The development of future-oriented processes* (pp. 141–176). Chicago: University of Chicago Press.

Bidell, T. R., & Fischer, K. W. (1996). Between nature and nurture: The role of human agency in the epigenesis of intelligence. In R. Sternberg & E. Grigorenko (Eds.), *Intelligence: Heredity and environment* (pp. 193–242). Cambridge, England: Cambridge University Press.

Biggs, J., & Collis, K. (1982). *Evaluating the quality of learning: The SOLO taxonomy (Structure of the Observed Learning Outcome).* New York: Academic Press.

Block, J. (1993). Studying personality the long way. In D. C. Funder, R. D. Parke, C. Tomlinson-Keasey, & K. Widaman (Eds.), *Studying lives through time: Personality and development* (pp. 9–41). Washington, DC: American Psychological Association.

Bond, T. G., & Fox, C. M. (2001). *Applying the Rasch model: Fundamental measurement in the human sciences.* Mahwah, NJ: Erlbaum.

Bourgeois, J.-P., & Rakic, P. (1993). Changes of synaptic density in the primary visual cortex of the macaque monkey from fetal to adult stage. *Journal of Neuroscience, 13,* 2801–2820.

Brainerd, C. J. (1978). The stage question in cognitive-developmental theory. *The Behavioral and Brain Sciences, 1,* 173–182.

Bretherton, I., & Munholland, K. A. (1999). Internal working models in attachment relationships. In J. Cassidy & P. R. Shaver (Eds.), *Handbook of attachment: Theory, research, and clinical applications* (pp. 89–111). New York: Guilford Press.

Breuer, J., & Freud, S. (1955). *Standard edition of the complete psychological works of Sigmund Freud: Vol. 2. Studies on hysteria* (A. Strachey & J. Strachey, Trans.). London: Hogarth Press.

Bronfenbrenner, U. (1979). *The ecology of human development: Experiments by nature and design.* Cambridge, MA: Harvard University Press.

Bronfenbrenner, U. (1993). The ecology of cognitive development: Research models and fugitive findings. In R. H. Wozniak & K. W. Fischer (Eds.), *Development in context: Acting and thinking in specific environments* (pp. 3–44). Hillsdale, NJ: Erlbaum.

Brown, A. L., & Palincsar, A. S. (1989). Guided, cooperative learning and individual knowledge acquisition. In L. B. Resnick (Ed.), *Knowing, learning, and instruction: Essays in honor of Robert Glaser* (pp. 393–451). Hillsdale, NJ: Erlbaum.

Brown, A. L., & Reeve, R. (1987). Bandwidths of competence: The role of supportive contexts in learning and development. In L. S. Liben (Ed.), *Development and learning: Conflict or congruence?* (pp. 173–223). Hillsdale, NJ: Erlbaum.

Brown, T. (1994). Affective dimensions of meaning. In W. T. Overton & D. S. Palermo (Eds.), *The nature and ontogenesis of meaning* (pp. 167–190). Hillsdale, NJ: Erlbaum.

Bruner, J. S. (1973). Organization of early skilled action. *Child Development, 44,* 1–11.

Bruner, J. S. (1990). *Acts of meaning.* Cambridge, MA: Harvard University Press.

Bruner, J. S., Goodnow, J. J., & Austin, G. (1956). *A study of thinking.* New York: Wiley.

Buchsbaum, H. K., Toth, S. L., Clyman, R. B., Cicchetti, D., & Emde, R. N. (1992). The use of a narrative story stem technique with maltreated children: Implications for theory and practice. *Development and Psychopathology, 4,* 603–625.

Bullock, D., Grossberg, S., & Guenther, F. H. (1993). A self-organizing neural model of motor equivalent reaching and tool use by a multijoint arm. *Journal of Cognitive Neuroscience, 5,* 408–435.

Cairns, R. B. (1979). *Social development: The origins and plasticity of interchanges.* San Francisco: Freeman.

Cairns, R. B., Elder, G. H., Jr., & Costello, E. J. (1996). *Developmental science.* Cambridge, England: Cambridge University Press.

Calverley, R., Fischer, K. W., & Ayoub, C. (1994). Complex splitting of self-representations in sexually abused adolescent girls. *Development and Psychopathology, 6,* 195–213.

Campbell, D. T., & Stanley, J. C. (1963). *Experimental and quasi-experimental designs for research.* Chicago: Rand McNally.

Campos, J. J., Anderson, D. I., Barbu-Roth, M. A., Hubbard, E. M., Hertenstein, M. J., & Witherington, D. (2000). Travel broadens the mind. *Infancy, 1,* 149–219.

Campos, J. J., Barrett, K. C., Lamb, M. E., Goldsmith, H. H., & Stenberg, C. (1983). Socioemotional development. In M. M. Haith & J. J. Campos (Eds.), *Infancy and developmental psychobiology* (4th ed., Vol. 2, pp. 783–915). New York: Wiley.

Camras, L. A. (1992). Expressive development and basic emotions. *Cognition and Emotion, 6,* 269–284.

Canadian Broadcasting Corporation. (1990). *To a safer place* [Television broadcast].

Carey, S., & Gelman, R. (Eds.). (1991). *The epigenesis of mind: Essays on biology and knowledge.* Hillsdale, NJ: Erlbaum.

Carey, S., & Spelke, E. (1994). Domain-specific knowledge and conceptual change. In L. A. Hirschfeld & S. A. Gelman (Eds.), *Mapping the mind: Domain specificity in cognition and culture* (pp. 169–200). Cambridge, England: Cambridge University Press.

Carey, S., & Spelke, E. (1996). Science and core knowledge. *Journal of Philosophy of Science, 63,* 515–533.

Case, R. (1985). *Intellectual development: Birth to adulthood.* New York: Academic Press.

Case, R. (1991a). A developmental approach to the design of remedial instruction. In A. McKeough & J. L. Lupart (Eds.), *Toward the practice of theory-based instruction: Current cognitive theories and their educational promise* (pp. 117–147). Hillsdale, NJ: Erlbaum.

Case, R. (Ed.). (1991b). *The mind's staircase: Exploring the conceptual underpinnings of children's thought and knowledge.* Hillsdale:, NJ Erlbaum.

Case, R., & Okamoto, Y. (with Griffin, S., McKeough, A., Bleiker, C., Henderson, B., & Stephenson, K. M.). (1996). The role of central conceptual structures in the development of children's thought. *Monographs of the Society for Research in Child Development, 61*(5–6, Serial No. 246).

Cassidy, J., & Shaver, P. (Eds.). (1999). *Handbook of attachment: Theory, research and clinical applications.* New York: Guilford Press.

Chapman, M. (1988). *Constructive evolution.* New York: Cambridge University Press.

Cheng, C.-L. (1999). Constructing self-representations through social comparison in peer relations: The development of Taiwanese grade-school children. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 59*(9-B), 5132.

Chomsky, N. (1957). *Syntactic structures.* The Hague, The Netherlands: Mouton.

Chomsky, N. (1965). *Aspects of the theory of syntax.* Cambridge, MA: MIT Press.

Chomsky, N. (1995). *The minimalist program* (Vol. 28). Cambridge, MA: MIT Press.

Cicchetti, D. (1990). The organization and coherence of socioemotional, cognitive, and representational development: Illustrations through a developmental psychopathology perspective on Down syndrome and child maltreatment. In R. Thompson & R. A. Dienstbier (Eds.), *Socioemotional development* (Vol. 36, pp. 259–366). Lincoln: University of Nebraska Press.

Clark, K. B., & Clark, M. K. (1958). Racial identification and preference in Negro children. In E. E. Maccoby, T. M. Newcomb, & E. L. Hartley (Eds.), *Readings in social psychology* (3rd ed., pp. 602–611). New York: Holt.

Colby, A., Kohlberg, L., Gibbs, J., & Lieberman, M. (1983). A longitudinal study of moral judgement. *Monographs of the Society for Research in Child Development, 48*(1, Serial No. 200).

Cole, M. (1992). Culture in development. In M. H. Bornstein & M. E. Lamb (Eds.), *Developmental psychology: An advanced textbook.* Hillsdale, NJ: Erlbaum.

Cole, M. (1996). *Cultural psychology: A once and future discipline.* Cambridge, MA: Harvard University Press.

Commons, M. L., Trudeau, E. J., Stein, S. A., Richards, F. A., & Krause, S. R. (1998). Hierarchical complexity of tasks shows the existence of developmental stages. *Developmental Review, 18,* 237–278.

Corrigan, R. (1983). The development of representational skills. In K. W. Fischer (Ed.), *Levels and transitions in children's development* (Vol. 21, pp. 51–64). San Francisco: Jossey-Bass.

Costa, P. T., Jr., & McCrae, R. R. (1997). Longitudinal stability of adult personality. In R. Hogan, J. Johnson, & S. Briggs (Eds.), *Handbook of personality psychology* (pp. 269–290). San Diego, CA: Academic Press.

Crouch, C. H., Fagen, A. P., Callan, P., & Mazur, E. (2004). Classroom demonstrations: Learning tools or entertainment? *American Journal of Physics, 72,* 835–838.

Damasio, A. R. (1994). *Descartes' error: Emotion, reason, and the human brain.* New York: Grosset/Putnam.

Damasio, A. R. (2003). *Looking for Spinoza: Joy, sorrow, and the feeling brain.* New York: Harcourt/Harvest.

Damon, W. (1989). Introduction: Advances in developmental research. In W. Damon (Ed.), *Child development today and tomorrow* (pp. 1–13). San Francisco: Jossey-Bass.

Dawson, G., & Fischer, K. W. (Eds.). (1994). *Human behavior and the developing brain.* New York: Guilford Press.

Dawson, T. L. (2003). A stage is a stage is a stage: A direct comparison of two scoring systems. *Journal of Genetic Psychology, 164,* 335–364.

Dawson, T. L., & Gabrielian, S. (2003). Developing conceptions of authority and contract across the lifespan: Two perspectives. *Developmental Review, 23,* 162–218.

Dawson, T. L., & Wilson, M. (2004). The LAAS: A computerizable scoring system for small- and large-scale developmental assessments. *Educational Assessment, 9,* 153–191.

Dawson, T. L., Xie, Y., & Wilson, J. (2003). Domain-general and domain-specific developmental assessments: Do they measure the same thing? *Cognitive Development, 18*(2003), 61–78.

Dawson-Tunik, T. L. (2004). "A good education is . . ." The development of evaluative thought across the life-span. *Genetic, Social, & General Psychology Monographs, 130,* 4–112.

Deacon, T. W. (1997). *The symbolic species: The co-evolution of language and the brain.* New York: Norton.

Dehaene, S. (1997). *The number sense: How the mind creates mathematics.* New York: Oxford University Press.

Demetriou, A., Christou, C., Spanoudis, G., & Platsidou, M. (2002). The development of mental processing: Efficiency, working memory, and thinking. *Monographs of the Society for Research in Child Development, 67*(1, Serial No. 173).

Descartes, R. (1960). *Meditations on first philosophy* (L. J. LaFleur, Trans., 2nd ed.). New York: Bobbs-Merrill.

Diamond, A. (1985). Development of the ability to use recall to guide action, as indicated by infants' performance on AB. *Child Development, 56,* 868–883.

Dixon, R. A., & Lerner, R. M. (1992). A history of systems in developmental psychology. In M. H. Bornstein & M. E. Lamb (Eds.), *Developmental psychology: An advanced textbook.* Hillsdale, NJ: Erlbaum.

Dunbar, K. (2001). The analogical paradox: Why analogy is so easy in naturalistic settings, yet so difficult in the psychological laboratory. In D. Gentner, K. J. Holyoak, & B. Kokinov (Eds.), *The analogical mind: Perspectives from cognitive science* (pp. 313–334). Cambridge, MA: MIT Press.

Edelstein, W., & Case, R. (Eds.). (1993). *Constructivist approaches to development: Contributions to human development* (Vol. 23, pp. 33–56). Basel, Switzerland: S. Karger.

Edwards, C. P. (1984). The age group labels and categories of preschool children. *Child Development, 55,* 440–452.

Ekman, P., Friesen, W. V., O'Sullivan, M., Chan, A., Diacoyanni-Tarlatis, I., Heider, K., et al. (1987). Universals and cultural differences in the judgments of facial expressions of emotion. *Journal of Personality and Social Psychology, 53,* 712–717.

Elman, J. L., Bates, E. A., Johnson, M. K., Karmiloff-Smith, A., Parisi, D., & Plunkett, K. (1996). *Rethinking innateness: A connectionist perspective on development.* Cambridge, MA: Bradford Books.

Ericsson, K. A., & Charness, N. (1994). Expert performance: Its structure and acquisition. *American Psychologist, 49,* 725–747.

Erikson, E. (1963). *Childhood and society* (2nd ed.). New York: Norton.

Estes, W. K. (1956). The problem of inference from curves based on group data. *Psychological Review, 53,* 134–140.

Feffer, M. (1982). *The structure of Freudian thought.* New York: International Universities Press.

Fink, R. P. (in press). What successful adults with dyslexia teach educators about children. In K. W. Fischer, J. H. Bernstein, & M. H. Immordino-Yang (Eds.), *Mind, brain, and education in reading disorders.* Cambridge, England: Cambridge University Press.

Fischer, K. W. (1980a). Learning and problem solving as the development of organized behavior. *Journal of Structural Learning, 6,* 253–267.

Fischer, K. W. (1980b). A theory of cognitive development: The control and construction of hierarchies of skills. *Psychological Review, 87,* 477–531.

Fischer, K. W. (1983). Illuminating the processes of moral development: A commentary—A longitudinal study of moral judgment. *Monographs of the Society for Research in Child Development, 48*(Serial No. 200), 97–107.

Fischer, K. W., & Ayoub, C. (1994). Affective splitting and dissociation in normal and maltreated children: Developmental pathways for self in relationships. In D. Cicchetti & S. L. Toth (Eds.), *Disorders and dysfunctions of the self* (Vol. 5, pp. 149–222). Rochester, NY: Rochester University Press.

Fischer, K. W., Ayoub, C. C., Noam, G. G., Singh, I., Maraganore, A., & Raya, P. (1997). Psychopathology as adaptive development along distinctive pathways. *Development and Psychopathology, 9,* 751–781.

Fischer, K. W., Bernstein, J. H., & Immordino-Yang, M. H. (in press). *Mind, brain, and education in reading disorders.* Cambridge, England: Cambridge University Press.

Fischer, K. W., & Bidell, T. (1991). Constraining nativist inferences about cognitive capacities. In S. Carey & R. Gelman (Eds.), *The epigenesis of mind: Essays on biology and cognition—The Jean Piaget Symposium Series* (pp. 199–235). Hillsdale, NJ: Erlbaum.

Fischer, K. W., & Bullock, D. (1981). Patterns of data: Sequence, synchrony, and constraint in cognitive development. In K. W. Fischer (Ed.), *Cognitive development* (Vol. 12, pp. 69–78). San Francisco: Jossey-Bass.

Fischer, K. W., & Bullock, D. (1984). Cognitive development in school-age children: Conclusions and new directions. In W. A. Collins (Ed.), *Development during middle childhood: The years from six to twelve* (pp. 70–146). Washington, DC: National Academy Press.

Fischer, K. W., Bullock, D. H., Rotenberg, E. J., & Raya, P. (1993). The dynamics of competence: How context contributes directly to skill. In R. H. Wozniak & K. W. Fischer (Eds.), *Development in context: Acting and thinking in specific environments—The Jean Piaget Symposium Series* (pp. 93–117). Hillsdale, NJ: Erlbaum.

Fischer, K. W., & Connell, M. W. (2003). Two motivational systems that shape development: Epistemic and self-organizing. *British Journal of Educational Psychology: Monograph*(2, Series II), 103–123

Fischer, K. W., & Farrar, M. J. (1987). Generalizations about generalization: How a theory of skill development explains both generality and specificity—The neo-Piagetian theories of cognitive development: Toward an integration [Special issue]. *International Journal of Psychology, 22*(5/6), 643–677.

Fischer, K. W., & Granott, N. (1995). Beyond one-dimensional change: Parallel, concurrent, socially distributed processes in learning and development. *Human Development, 38,* 302–314.

Fischer, K. W., Hencke, R., & Hand, H. H. (1994). *Mean and nice interaction scale: Peers* (Test manual). Cambridge, MA: Harvard University, Cognitive Development Laboratory.

Fischer, K. W., & Hogan, A. E. (1989). The big picture for infant development: Levels and variations. In J. J. Lockman & N. L. Hazen (Eds.), *Action in social context: Perspectives on early development* (pp. 275–305). New York: Plenum Press.

Fischer, K. W., & Immordino-Yang, M. H. (2002). Cognitive development and education: From dynamic general structure to specific learning and teaching. In E. Lagemann (Ed.), *Traditions of scholarship in education.* Chicago: Spencer Foundation.

Fischer, K. W., & Kennedy, B. (1997). Tools for analyzing the many shapes of development: The case of self-in-relationships in Korea. In E. Amsel & K. A. Renninger (Eds.), *Change and development: Issues of theory, method, and application* (pp. 117–152). Mahwah, NJ: Erlbaum.

Fischer, K. W., Knight, C. C., & Van Parys, M. (1993). Analyzing diversity in developmental pathways: Methods and concepts. *Constructivist Approaches to Development: Contributions to Human Development, 23,* 33–56.

Fischer, K. W., Pipp, S. L., & Bullock, D. (1984). Detecting discontinuities in development: Method and measurement. In R. Emde & R. Harmon (Eds.), *Continuities and discontinuities in development* (pp. 95–121). New York: Plenum Press.

Fischer, K. W., & Pruyne, E. (2002). Reflective thinking in adulthood: Emergence, development, and variation. In J. Demick & C. Andreoletti (Eds.), *Handbook of adult development* (pp. 169–197). New York: Plenum Press.

Fischer, K. W., & Rose, S. P. (1994). Dynamic development of coordination of components in brain and behavior: A framework for theory and research. In G. Dawson & K. W. Fischer (Eds.), *Human behavior and the developing brain* (pp. 3–66). New York: Guilford Press.

Fischer, K. W., & Rose, S. P. (1996). Dynamic growth cycles of brain and cognitive development. In R. Thatcher, G. R. Lyon, J. Rumsey, & N. Krasnegor (Eds.), *Developmental neuroimaging: Mapping the development of brain and behavior* (pp. 263–279). New York: Academic Press.

Fischer, K. W., & Rose, S. P. (1999). Rulers, clocks, and nonlinear dynamics: Measurement and method in developmental research. In G. Savelsbergh, H. van der Maas, & P. van Geert (Eds.), *Nonlinear developmental processes* (pp. 197–212). Amsterdam: Royal Netherlands Academy of Arts and Sciences.

Fischer, K. W., Rose, L. T., & Rose, S. P. (in press). Growth cycles of mind and brain: Analyzing developmental pathways of learning disorders. In K. W. Fischer, J. H. Bernstein, & M. H. Immordino-Yang (Eds.), *Mind, brain, and education in reading disorders.* Cambridge, England: Cambridge University Press.

Fischer, K. W., Shaver, P. R., & Carnochan, P. (1990). How emotions develop and how they organise development. *Cognition and Emotion, 4*(2), 81–127.

Fischer, K. W., & Silvern, L. (1985). Stages and individual differences in cognitive development. *Annual Review of Psychology, 36,* 613–648.

Fischer, K. W., Wang, L., Kennedy, B., & Cheng, C. (1998). Culture and biology in emotional development. In D. Sharma & K. W. Fischer (Eds.), *Socioemotional development across cultures* (Vol. 81, pp. 21–43). San Francisco: Jossey-Bass.

Fischer, K. W., & Watson, M. W. (2001). Die dynamische Entwicklung sozio-emotionaler Rollen und ihre Verzerrungen in Familien: Der Ödipuskonflikt [Dynamic development of socioemotional roles and distortions in families: The case of the Oedipus conflict]. In G. Röper, C. von Hagen, & G. Noam (Eds.), *Entwicklung und Risiko: Perspektiven einer Klinischen Entwicklungspsychologie* [Risk and Development: Perspectives from Clinical Developmental Psychology] (pp. 86–116). Stuttgart, Germany: Verlag W. Kohlhammer.

Fischer, K. W., Yan, Z., & Stewart, J. (2003). Adult cognitive development: Dynamics in the developmental web. In J. Valsiner & K. Connolly (Eds.), *Handbook of developmental psychology* (pp. 491–516). Thousand Oaks, CA: Sage.

Flavell, J. (1982). Structures, stages, and sequences in cognitive development. In W. A. Collins (Ed.), *The concept of development* (Vol. 15). Hillsdale, NJ: Erlbaum.

Flavell, J. H. (1971). Stage-related properties of cognitive development. *Cognitive Psychology, 2,* 421–453.

Flavell, J. H., & Wohlwill, J. F. (1969). Formal and functional aspects of cognitive development. In D. Elkind & J. H. Flavell (Eds.),

Studies in cognitive development (pp. 67–120). London: Oxford University Press.

Fleishman, E. A. (1975). Toward a taxonomy of human performance. *American Psychologist, 30,* 1127–1149.

Fodor, J. (1983). *The modularity of mind: An essay on faculty psychology.* Cambridge, MA: MIT Press.

Fodor, J. A. (1975). *The language of thought.* New York: Crowell.

Fogel, A., & Lyra, M. C. D. P. (1997). Dynamics of development in relationships. In F. Masterpasqua & P. A. Perna (Eds.), *The psychological meaning of chaos* (pp. 75–94). Washington, DC: American Psychological Association.

Fontaine, J. R. J., Poortinga, Y. H., Setiadi, B., & Markam, S. S. (2002). Cognitive structure of emotion terms in Indonesia and The Netherlands. *Cognition and Emotion, 16,* 61–86.

Foulkes, D. (1982). *Children's dreams: Longitudinal studies.* New York: Wiley.

Fraley, R. C., & Shaver, P. R. (2000). Adult romantic attachment: Theoretical developments, emerging controversies, and unanswered questions. *Review of General Psychology, 4,* 132–154.

Freud, S. (1955). Analysis of a phobia in a 5-year-old boy. In J. Strachey (Ed.), *Standard edition of the complete psychological works of Sigmund Freud* (Vol. 10, pp. 3–152). London: Hogarth Press.

Frijda, N. H. (1986). *The emotions.* Cambridge, England: Cambridge University Press.

Gardner, H. (1983). *Frames of mind: The theory of multiple intelligences.* New York: Basic Books.

Gardner, H. (1985). *The mind's new science: A history of the cognitive revolution.* New York: Basic Books.

Gardner, H. (1993). *Creating minds.* New York: Basic Books.

Gauvain, M. (1995). Thinking in niches: Sociocultural influences on cognitive development. *Human Development, 38,* 25–45.

Gelman, R. (1972). Logical capacity of very young children: Number invariance rules. *Child Development, 43,* 75–90.

Gelman, R. (1978). Cognitive development. *Annual Review of Psychology, 29,* 297–332.

Gelman, R., & Baillargeon, R. (1983). A review of some Piagetian concepts. In J. H. Flavell & E. M. Markman (Eds.), *Cognitive development* (Vol. 3, pp. 167–230). New York: Wiley.

Gibson, J. J. (1979). *The ecological approach to visual perception.* Boston: Houghton-Mifflin.

Goldin-Meadow, S. (2003). *Hearing gesture: How our hands help us think.* Cambridge, MA: Harvard University Press.

Goldin-Meadow, S., & Alibali, M. W. (2002). Looking at the hands through time: A microgenetic perspective on learning and instruction. In N. Granott & J. Parziale (Eds.), *Microdevelopment: Transition processes in development and learning* (pp. 80–105). Cambridge, England: Cambridge University Press.

Goldin-Meadow, S., Alibali, M., & Church, R. B. (1993). Transitions in concept acquisition: Using the hand to read the mind. *Psychological Review, 100,* 279–297.

Goodwin, B. (1994). *How the leopard changed its spots: The evolution of complexity.* New York: Charles Scribner's Sons.

Gottlieb, D. E., Taylor, S. E., & Ruderman, A. (1977). Cognitive bases of children's moral judgments. *Developmental Psychology, 13,* 547–556.

Gottlieb, G. (2001). *Individual development and evolution: The genesis of novel behavior* (Rev. ed.). New York: Oxford University Press.

Granott, N. (1994). Microdevelopment of co-construction of knowledge during problem-solving: Puzzled minds, weird creatures, and wuggles. *Dissertation Abstracts International, 54*(10B), 5409.

Granott, N. (2002). How microdevelopment creates macrodevelopment: Reiterated sequences, backward transitions, and the zone of current development. In N. Granott & J. Parziale (Eds.), *Microdevelopment: Transition processes in development and learning* (pp. 213–242). Cambridge, England: Cambridge University Press.

Granott, N., Fischer, K. W., & Parziale, J. (2002). Bridging to the unknown: A transition mechanism in learning and problem-solving. In N. Granott & J. Parziale (Eds.), *Microdevelopment: Transition processes in development and learning* (pp. 131–156). Cambridge, England: Cambridge University Press.

Granott, N., & Parziale, J. (Eds.). (2002). *Microdevelopment: Transition processes in development and learning.* Cambridge, England: Cambridge University Press.

Gray, J. R., Braver, T. S., & Raichle, M. E. (2002). Integration of emotion and cognition in the lateral prefrontal cortex. *Proceedings of the National Academy of Science, 99*(6), 4115–4120.

Greeno, J. G., Riley, M. S., & Gelman, R. (1984). Conceptual competence and children's counting. *Cognitive Psychology, 16,* 94–143.

Greenwald, A. G., Banaji, M. R., Rudman, L., Farnham, S., Nosek, B. A., & Mellott, D. (2002). A unified theory of implicit attitudes, stereotypes, self-esteem, and self-concept. *Psychological Review, 109,* 3–25.

Grossberg, S. (1987). *The adaptive brain.* Amsterdam: Elsevier/North-Holland.

Grossberg, S. (2000). The complementary brain: Unifying brain dynamics and modularity. *Trends in Cognitive Sciences, 4,* 233–246.

Gruber, H. E. (1973). Courage and cognitive growth in children and scientists. In M. Schwebel & J. Raph (Eds.), *Piaget in the classroom.* New York: Basic Books.

Gruber, H. E. (1981). *Darwin on man* (2nd ed.). Chicago: University of Chicago Press.

Guttman, L. (1944). A basis for scaling qualitative data. *American Sociological Review, 9,* 139–150.

Hagne, I., Persson, J., Magnusson, R., & Petersén, I. (1973). Spectral analysis via fast fourier transform of waking EEG in normal infants. In P. Kellaway & I. Petersén (Eds.), *Automation of clinical electroencephalography* (pp. 103–143). New York: Raven.

Halford, G. S. (1982). *The development of thought.* Hillsdale, NJ: Erlbaum.

Halford, G. S. (1989). Reflections on 25 years of Piagetian cognitive developmental psychology, 1963–1988. *Human Development, 32,* 325–357.

Hall, G. S. (1904). *Adolescence: Its psychology and its relations to physiology, anthropology, sociology, sex, crime, religion, and education.* New York: Appleton.

Hand, H. H. (1982). The development of concepts of social interaction: Children's understanding of nice and mean. *Dissertation Abstracts International, 42*(11), 4578B.

Hanson, N. R. (1961). *Patterns of discovery.* Cambridge, England: Cambridge University Press.

Hartelman, P. A., van der Maas, H. L. J., & Molenaar, P. C. M. (1998). Detecting and modelling developmental transitions. *British Journal of Developmental Psychology, 16*(Pt. 1), 97–122.

Harter, S. (1999). *The construction of self: A developmental perspective.* New York: Guilford Press.

Harter, S., & Buddin, B. (1987). Children's understanding of the simultaneity of two emotions: A five-stage developmental sequence. *Developmental Psychology, 23,* 388–399.

Harter, S., & Monsour, A. (1992). Developmental analysis of conflict caused by opposing attributes in the adolescent self-portrait. *Developmental Psychology, 28,* 251–260.

Hauser, M. D., Chomsky, N., & Fitch, W. T. (2002). The faculty of language: What is it, who has it, and how did it evolve? *Science, 298,* 1569–1579.

Hayes, J. R. (1985). Three problems in teaching general skills. In S. F. Chipman & J. W. Segal & R. Glaser (Eds.), *Thinking and learning skills: Research and open questions* (Vol. 2, pp. 391–406). Hillsdale, NJ: Erlbaum.

Heider, K. (1991). *Landscapes of emotion: Mapping three cultures of emotion in Indonesia.* New York: Cambridge University Press.

Hencke, R. W. (1996). *Self stories: Effects of children's emotional styles on their appropriation of self-schemata.* Unpublished doctoral dissertation, Harvard University, Cambridge, MA.

Higgins, E. T. (1996). Knowledge activation: Accessibility, applicability, and salience. In E. T. Higgins & A. W. Kruglanski (Eds.), *Social psychology: Handbook of basic principles* (pp. 133–168). New York: Guilford Press.

Hilgard, E. R. (1977). *Divided consciousness.* New York: Wiley.

Hirschfeld, L. A., & Gelman, S. A. (1994). *Mapping the mind: Domain specificity in cognition and culture.* Cambridge, England: Cambridge University Press.

Holland, J. H. (1992). Genetic algorithms. *Scientific American, 266*(7), 44–50.

Horn, J. L., & Hofer, S. M. (1992). Major abilities and development in the adult period. In R. J. Sternberg & C. A. Berg (Eds.), *Intellectual development* (pp. 44–99). Cambridge, England: Cambridge University Press.

Hua, J. Y., & Smith, S. J. (2004). Neural activity and the dynamics of central nervous system development. *Nature Neuroscience, 7,* 327–332.

Hubel, D. H., & Wiesel, T. N. (1977). Functional architecture of macaque monkey visual cortex. *Proceedings of the Royal Society, London, 193*(Series B), 1–59.

Hudspeth, W. J., & Pribram, K. H. (1992). Psychophysiological indices of cerebral maturation. *International Journal of Psychophysiology, 12,* 19–29.

Huttenlocher, P. R. (2002). *Neural plasticity: The effects of environment on the development of the cerebral cortex.* Cambridge, MA: Harvard University Press.

Immordino-Yang, M. H., & Fischer, K. W. (in press). Dynamic development of brain and behavior: Hemispheric biases, interactions, and the role of development. In D. Coch, K. W. Fischer, & G. Dawson (Eds.), *Human behavior and the developing brain: Vol. 1. Normal Development.* New York: Guilford Press.

Inhelder, B., & Piaget, J. (1964). *The early growth of logic in the child* (G. A. Lunzer & D. Papert, Trans.). New York: Harper & Row.

John, E. R. (1977). *Functional neuroscience: Vol. 2. Neurometrics.* Hillsdale, NJ: Erlbaum.

Kagan, J., & Snidman, N. (2004). *The long shadow of temperament.* Cambridge, MA: Belknap Press.

Kant, I. (1958). *Critique of pure reason* (N. K. Smith, Trans.). New York: Random House Modern Library.

Kauffman, S. (1996). *At home in the universe: The search for laws of self-organization and complexity.* New York: Oxford University Press.

Kauffman, S. A. (1993). *The origins of order: Self-organization and selection in evolution.* Oxford, England: Oxford University Press.

Kelso, J. A. S. (1995). *The self-organization of brain and behavior.* Cambridge, MA: MIT Press.

Kennedy, B. (1991). The development of self-understanding in adolescence. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 55*(7-B), 3036.

King, P. M., & Kitchener, K. S. (1994). *Developing reflective judgment: Understanding and promoting intellectual growth and critical thinking in adolescents and adults.* San Francisco: Jossey-Bass.

Kitayama, S., Markus, H. R., & Matsumoto, H. (1995). Culture, self, and emotion: A cultural perspective on "self-conscious" emotions. In J. Tangney & K. W. Fischer (Eds.), *Self-conscious emotions: The psychology of shame, guilt, embarrassment, and pride* (pp. 439–464). New York: Guilford Press.

Kitchener, K. S., & King, P. M. (1990). The reflective judgment model: Ten years of research. In M. L. Commons, C. Armon, L. Kohlberg, F. A. Richards, T. A. Grotzer, & J. D. Sinnott (Eds.), *Adult development 3: Models and methods in the study of adolescent and adult thought* (pp. 62–78). New York: Praeger.

Kitchener, K. S., Lynch, C. L., Fischer, K. W., & Wood, P. K. (1993). Developmental range of reflective judgment: The effect of contextual support and practice on developmental stage. *Developmental Psychology, 29,* 893–906.

Kitchener, R. F. (1986). *Piaget's theory of knowledge: Genetic epistemology and scientific reason.* New Haven, CT: Yale University Press.

Klahr, D., & Wallace, J. G. (1976). *Cognitive development: An information-processing view.* Hillsdale, NJ: Erlbaum.

Knight, C. C., & Fischer, K. W. (1992). Learning to read words: Individual differences in developmental sequences. *Journal of Applied Developmental Psychology, 13,* 377–404.

Kofsky, E. (1966). A scalogram study of classificatory development. *Child Development, 37,* 191–204.

Kohlberg, L. (1969). Stage and sequence: The cognitive developmental approach to socialization. In D. A. Goslin (Ed.), *Handbook of socialization theory and research* (pp. 347–480). Chicago: Rand, McNally.

Kohlberg, L. (1984). Moral stages and moralization: The cognitive-developmental approach. In L. Kohlberg (Ed.), *The psychology of moral development: The nature and validity of moral stages* (pp. 170–205). San Francisco: Harper & Row.

Kosslyn, S. M. (1996). *Image and brain: The resolution of the imagery debate.* Cambridge, MA: MIT Press.

Kruhl, J. H., Blenkinsop, T. G., & Kupkova, M. (Eds.). (2000). *Fractals and dynamic systems in geoscience.* Boston: Birkhauser.

Krus, D. J. (1977). Order analysis: An inferential model of dimensional analysis and scaling. *Educational and Psychological Measurement, 37,* 587–601.

Kuhn, T. (1970). *The structure of scientific revolutions* (2nd ed.). Chicago: University of Chicago.

Kupersmidt, J. B., & Dodge, K. A. (Eds.). (2004). *Children's peer relations: From development to intervention.* Washington, DC: American Psychological Association.

Kurtz, K. J., Miao, C.-H., & Gentner, D. (2001). Learning by analogical bootstrapping. *Journal of the Learning Sciences, 10,* 417–446.

Lakoff, G. (1987). *Women, fire, and dangerous things: What categories reveal about the mind.* Chicago: University of Chicago Press.

Lakoff, G., & Johnson, M. (1980). *Metaphors we live by.* Chicago: University of Chicago Press.

Lakoff, G., & Johnson, M. (1999). *Philosophy in the flesh: The embodied mind and its challenge to Western thought.* New York: Basic Books.

Lamborn, S. D., Fischer, K. W., & Pipp, S. (1994). Constructive criticism and social lies: A developmental sequence for understanding honesty and kindness in social interactions. *Developmental Psychology, 30*(4), 495–508.

Lampl, M., & Johnson, M. L. (1998). Normal human growth as saltatory: Adaptation through irregularity. In K. M. Newell & P. C. M. Molenaar (Eds.), *Applications of nonlinear dynamics to developmental process modeling* (pp. 15–38). Mahwah, NJ: Erlbaum.

Lazarus, R. S. (1991). *Emotion and adaptation.* New York: Oxford University Press.

Lerner, R. M. (2002). *Concepts and theories of human development* (3rd ed.). Mahwah, NJ: Erlbaum.

Lerner, R. M., & Busch-Rossnagel, N. A. (Eds.). (1981). *Individuals as producers of their own development: A life-span perspective.* New York: Academic Press.

LeVine, R. A., Miller, P. M., & West, M. M. (Eds.). (1988). *Parental behavior in diverse societies* (Vol. 40). San Francisco: Jossey-Bass.

Li, J., Wang, L., & Fischer, K. W. (2004). The organization of shame words in Chinese. *Cognition and Emotion, 18,* 767–797.

Locke, J. (1794). *An abridgment of Mr. Locke's essay concerning human understanding.* Boston: Manning and Loring.

Lourenço, O., & Machado, A. (1996). In defense of Piaget's theory: A reply to 10 common criticisms. *Psychological Review, 103,* 143–164.

Luborsky, L. (2001). The only clinical and quantitative study since Freud of the preconditions for recurrent symptoms during psychotherapy and psychoanalysis. *International Journal of Psychoanalysis, 82,* 1133–1154.

Luborsky, L., & Crits-Christoph, P. (1990). *Understanding transference: The CCRT method.* New York: Basic Books.

Luborsky, L., Luborsky, E., Diguer, L., Schmidt, K., Dengler, D., Schaffler, P., et al. (1996). Is there a core relationship pattern at age 3 and does it remain at age 5? In G. G. Noam & K. W. Fischer (Eds.), *Development and vulnerability in close relationships* (pp. 287–308). Hillsdale, NJ: Erlbaum.

Lyons-Ruth, K., Alpern, L., & Repacholi, B. (1993). Disorganized infant attachment classification and maternal psychosocial problems as predictors of hostile-aggressive behavior in the preschool classroom. *Child Development, 64,* 572–585.

Main, M., & Solomon, J. (1990). Procedures for identifying infants as disorganized/disoriented during the Ainsworth strange situation. In M. Greenberg, D. Cichetti, & M. Cummings (Eds.), *Attachment in the preschool years* (pp. 121–160). Chicago: University of Chicago Press.

Marcus, G. F. (2004). *The birth of the mind: How a tiny number of genes creates the complexities of human thought.* New York: Basic Books.

Mareschal, D., Plunkett, K., & Harris, P. L. (1999). A computational and neuropsychological account of object-oriented behaviours in infancy. *Developmental Science, 2,* 306–317.

Markus, H. R., & Kitayama, S. (1991). Culture and the self: Implications for cognition, emotion, and motivation. *Psychological Review, 98,* 225–253.

Marrs, G. S., Green, S. H., & Dailey, M. E. (2001). Rapid formation and remodeling of postsynaptic densities in developing dendrites. *Nature Neuroscience, 4,* 1006–1013.

Mascolo, M. J., Fischer, K. W., & Li, J. (2003). Dynamic development of component systems of emotions: Pride, shame, and guilt in China and the United States. In R. J. Davidson, K. Scherer, & H. H. Goldsmith (Eds.), *Handbook of Affective Science* (pp. 375–408). Oxford, England: Oxford University Press.

Matousek, M., & Petersén, I. (1973). Frequency analysis of the EEG in normal children and adolescents. In P. Kellaway & I. Petersén (Eds.), *Automation of clinical electroencephalography* (pp. 75–102). New York: Raven Press.

McCall, R. B., Eichorn, D. H., & Hogarty, P. S. (1977). Transitions in early mental development. *Monographs of the Society for Research in Child Development, 42*(3, Serial No. 171).

McGuire, W. J., & McGuire, C. V. (1982). Significant others in the self-space: Sex differences and developmental trends in the social self. In J. Suls (Ed.), *Psychological perspectives of the self.* Hillsdale, NJ: Erlbaum.

McLaughlin, G. H. (1963). Psychologic: A possible alternative to Piaget's formulation. *British Journal of Educational Psychology, 33,* 61–67.

Miller, P. H., & Coyle, T. R. (1999). Developmental change: Lessons from microgenesis. In E. K. Scholnick, K. Nelson, & P. H. Miller (Eds.), *Conceptual development: Piaget's legacy* (pp. 209–239). Mahwah, NJ: Erlbaum.

Mischel, W. (1968). *Personality and assessment.* New York: Wiley.

Mizuno, T., Yamauchi, N., Watanabe, A., Komatsushiro, M., Takagi, T., Iinuma, K., et al. (1970). Maturation of patterns of EEG: Basic waves of healthy infants under 12 months of age. *Tohoku Journal of Experimental Medicine, 102,* 91–98.

Nelson, K. (1986). *Event knowledge: Structure and function in development.* Hillsdale, NJ: Erlbaum.

Newell, A., & Simon, H. A. (1971). *Human problem solving.* Englewood Cliffs, NJ: Prentice-Hall.

Ninio, A., & Snow, C. (1996). *Pragmatic development.* Boulder, CO: Westview.

Noam, G. G. (1990). Beyond Freud and Piaget: Biographical worlds—Interpersonal self. In T. E. Wren (Ed.), *The moral domain* (pp. 360–399). Cambridge, MA: MIT Press.

Noam, G. G., Paget, K., Valiant, G., Borst, S., & Bartok, J. (1994). Conduct and affective disorders in developmental perspective: A systematic study of adolescent psychopathology. *Development and Psychopathology, 6,* 519–523.

Nowak, A., Vallacher, R. R., Tesser, A., & Borkowski, W. (2000). Society of self: The emergence of collective properties in self-structure. *Psychological Review, 107,* 39–61.

Osgood, C. E., Suci, G. J., & Tannenbaum, P. (1957). *The measurement of meaning.* Urbana: University of Illinois Press.

Overton, W. F., & Newman, J. L. (1982). Cognitive development: A competence-activation/utilization approach. In T. M. Field, A. Huston, H. C. Quay, L. Troll, & G. E. Finley (Eds.), *Review of human development* (pp. 217–241). New York: Wiley.

Pascual-Leone, J. (1970). A mathematical model for the transition rule in Piaget's developmental stages. *Acta Psychologica, 32,* 301–345.

Pepper, S. C. (1942). *World hypotheses.* Berkeley: University of California.

Piaget, J. (1950). *The psychology of intelligence* (M. Piercy & D. E. Berlyne, Trans.). New York: Harcourt Brace.

Piaget, J. (1952). *The origins of intelligence in children* (M. Cook, Trans.). New York: International Universities Press.

Piaget, J. (1954). *The construction of reality in the child* (M. Cook, Trans.). New York: Basic Books.

Piaget, J. (1970). *Structuralism* (C. Maschler, Trans.). New York: Basic Books.

Piaget, J. (1971). The theory of stages in cognitive development. In D. R. Green, M. P. Ford, & G. B. Flamer (Eds.), *Measurement and Piaget* (pp. 1–11). New York: McGraw-Hill.

Piaget, J. (1983). Piaget's theory. In W. Kessen (Ed.), *History, theory, and methods* (Vol. 1, pp. 103–126). New York: Wiley.

Piaget, J. (1985). *The equilibration of cognitive structures: The central problem of cognitive development* (T. Brown & K. J. Thampy, Trans.). Chicago: University of Chicago Press.

Piaget, J. (1987). *Possibility and necessity* (H. Feider, Trans.). Minneapolis: University of Minnesota Press.

Piaget, J., & Garcia, R. (1991). *Toward a logic of meanings.* Hillsdale, NJ: Erlbaum.

Piaget, J., & Szeminska, A. (1952). *The child's conception of number* (C. Gattegno & F. M. Hodgson, Trans.). London: Routledge & Kegan Paul.

Pipp, S., Fischer, K. W., & Jennings, S. (1987). Acquisition of self and mother knowledge in infancy. *Developmental Psychology, 23*(1), 86–96.

Pirttilä-Backman, A.-M. (1993). *The social psychology of knowledge reassessed: Toward a new delineation of the field with empirical substantiation.* Unpublished doctoral dissertation, University of Helsinki, Helsinki, Finland.

Plato. (1941). *The republic* (F. M. Cornford, Trans.). London: Oxford University Press.

Plomin, R., DeFries, J., McClearn, G., & Rutter, M. (1997). *Behavioral genetics* (3rd ed.). New York: Worth.

Polsky, A., Mel, B. W., & Schiller, J. (2004). Computational subunits in thin dendrites of pyramidal cells. *Nature Neuroscience, 7,* 621–627.

Port, R. F., & van Gelder, T. (Eds.). (1995). *Mind as motion: Explorations in the dynamics of cognition.* Cambridge, MA: Bradford/MIT Press.

Price-Williams, D., Gordon, W., & Ramirez, M., III. (1969). Skill and conservation: A study of pottery making children. *Developmental Psychology, 1,* 769.

Putnam, F. (1997). *Dissociation in children and adolescents: A developmental perspective.* New York: Guilford Press.

Raizada, R., & Grossberg, S. (2003). Towards a theory of the laminar architecture of cerebral cortex: Computational clues from the visual system. *Cerebral Cortex, 13,* 100–113.

Rakic, P., Bourgeois, J.-P., Eckenhoff, M. F., Zecevic, N., & Goldman-Rakic, P. (1986). Concurrent overproduction of synapses in diverse regions of the primate cerebral cortex. *Science, 232,* 232–235.

Rappolt-Schlichtman, G., & Ayoub, C. C. (in press). Diverse developmental pathways, multiple levels of organization, and embedded contexts: Examining the whole child to generate usable knowledge. In K. W. Fischer & T. Katzir (Eds.), *Building usable knowledge in mind, brain, and education.* Cambridge, England: Cambridge University Press.

Rasch, G. (1980). *Probabilistic model for some intelligence and attainment tests.* Chicago: University of Chicago Press.

Raya, P. (1996). *Pretense in pair-play therapy: Examining the understanding of emotions in young at-risk children.* Unpublished doctoral dissertation, Harvard University, Cambridge, MA.

Reddy, M. (1979). The conduit metaphor. In A. Ortony (Ed.), *Metaphor and thought* (pp. 284–324). Cambridge, England: Cambridge University Press.

Reznick, J. S., & Goldfield, B. A. (1992). Rapid change in lexical development in comprehension and production. *Developmental Psychology, 28,* 406–413.

Rogoff, B. (1990). *Apprenticeship in thinking: Cognitive development in social context.* New York: Oxford University Press.

Rogoff, B. (2003). *The cultural nature of human development.* Oxford, England: Oxford University Press.

Rosch, E. (1978). Principles of categorization. In E. Rosch & B. B. Lloyd (Eds.), *Cognition and categorization* (pp. 27–48). Hillsdale, NJ: Erlbaum.

Rose, D., & Meyer, A. (2002). *Teaching every student in the digital age.* Alexandria, VA: American Association for Supervision & Curriculum Development.

Rotenberg, E. J. (1988). The effects of development, self-instruction, and environmental structure on understanding social interactions. *Dissertation Abstracts International, 49*(11), 5044B.

Ruhland, R., & van Geert, P. (1998). Jumping into syntax: Transitions in the development of closed class words. *British Journal of Developmental Psychology, 16*(Pt. 1), 65–95.

Russell, J. A., & Barrett, L. F. (1999). Core affect, prototypical emotional episodes, and other things called emotion: Dissecting the elephant. *Journal of Personality & Social Psychology, 76,* 805–819.

Salomon, G., & Perkins, D. N. (1989). Rocky roads to transfer: Rethinking mechanisms of a neglected phenomenon. *Educational Psychologist, 24,* 185–221.

Sameroff, A. (1975). Transactional models in early social relations. *Human Development, 18,* 65–79.

Saxe, R., Carey, S., & Kanwisher, N. (2004). Understanding other minds: Linking developmental psychology and functional neuroimaging. *Annual Review of Psychology, 55,* 87–124.

Scardamalia, M., & Bereiter, C. (1999). Schools as knowledge-building organizations. In D. P. Keating & C. Hertzman (Eds.), *Developmental health and the wealth of nations: Social, biological, and educational dynamics* (pp. 274–289). New York: Guilford Press.

Schank, R. C., & Abelson, R. P. (1977). *Scripts, plans, goals, and understanding.* Hillsdale, NJ: Erlbaum.

Scheff, T. J., & Retzinger, S. (1991). *Emotions and violence.* Lexington, MA: Lexington Books.

Scheibel, A., Conrad, T., Perdue, S., Tomiyasu, U., & Wechsler, A. (1990). A quantitative study of dendritic complexity in selected areas of the human cerebral cortex. *Brain and Cognition, 12,* 85–101.

Scherer, K. R., Wranik, T., Sangsue, J., Tran, V., & Scherer, U. (2004). Emotions in everyday life: Probability of occurrence, risk factors, appraisal and reaction patterns. *Social Science Information, 43,* 499–570.

Schlosberg, H. (1954). Three dimensions of emotion. *Psychological Review, 61,* 81–88.

Schore, A. N. (2003). *Affect regulation and the repair of the self.* New York: Norton.

Schwartz, M. S. (2000). *Design challenges: A new path to understanding science concepts and skills.* Unpublished doctoral dissertation, Harvard Graduate School of Education, Cambridge, MA.

Schwartz, M. S., & Fischer, K. W. (2005). Building general knowledge and skill: Cognition and microdevelopment in science. In A. Demetriou & A. Raftopoulos (Eds.), *Cognitive developmental change: Theories, models, and measurement* (pp. 157–185). Cambridge, England: Cambridge University Press.

Selman, R. L., & Schultz, L. H. (1990). *Making a friend in youth.* Chicago: University of Chicago Press.

Selman, R., Watts, C. L., & Schultz, L. H. (Eds.). (1997). *Fostering friendship: Pair therapy for prevention and treatment.* Pleasantville, NY: Aldine-De Gruyter.

Shaver, P. R., & Clark, C. L. (1996). Forms of adult romantic attachment and their cognitive and emotional underpinnings. In G. G. Noam & K. W. Fischer (Eds.), *Development and vulnerability in close relationships* (pp. 29–58). Hillsdale, NJ: Erlbaum.

Shaver, P. R., Morgan, H. J., & Wu, S. (1996). Is love a "basic" emotion? *Personal Relationships, 3,* 81–96.

Shaver, P. R., Murdaya, U., & Fraley, R. C. (2001). Structure of the Indonesian emotion lexicon. *Asian Journal of Social Psychology, 4,* 201–224.

Shaver, P. R., Schwartz, J., Kirson, D., & O'Connor, C. (1987). Emotion knowledge: Further exploration of a prototype approach. *Journal of Personality and Social Psychology, 52,* 1061–1086.

Shaver, P. R., Wu, S., & Schwartz, J. C. (1992). Cross-cultural similarities and differences in emotion and its representation: A prototype approach. In M. S. Clark (Ed.), *Review of Personality and Social Psychology* (Vol. 13, pp. 175–212). Newbury Park, CA: Sage.

Shultz, T. R. (2003). *Computational developmental psychology.* Cambridge, MA: MIT Press.

Siegler, R. S. (1994). Cognitive variability: A key to understanding cognitive development. *Current Directions in Psychological Science, 3,* 1–5.

Siegler, R. S. (2002). Microgenetic studies of self-explanation. In N. Granott & J. Parziale (Eds.), *Microdevelopment: Transition processes in development and learning.* Cambridge, England: Cambridge University Press.

Siegler, R. S., & Crowley, K. (1991). The microgenetic method: A direct means for studying cognitive development. *American Psychologist, 46,* 606–620.

Siegler, R. S., & Jenkins, E. (1989). *How children discover new strategies.* Hillsdale, NJ: Erlbaum.

Singer, J. D., & Willett, J. B. (2003). *Applied longitudinal data analysis: Modeling change and event occurrence.* New York: Oxford University Press.

Skinner, B. F. (1938). *The behavior of organisms.* New York: Appleton-Century-Crofts.

Skinner, B. F. (1969). *Contingencies of reinforcement: A theoretical analysis.* New York: Appleton-Century-Crofts.

Slobin, D. I. (Ed.). (1997). *The crosslinguistic study of language acquisition: Expanding the contexts* (Vols. 4–5). Hillsdale, NJ: Erlbaum.

Somsen, R. J. M., van 't Klooster, B. J., van der Molen, M. W., van Leeuwen, H. M. P., & Licht, R. (1997). Growth spurts in brain maturation during middle childhood as indexed by EEG power spectra. *Biological Psychology, 44,* 187–209.

Spelke, E. S. (1988). Where perceiving ends and thinking begins: The apprehension of objects in infancy. In A. Yonas (Ed.), *Perceptual Development in Infants* (Vol. 20, pp. 191–234). Hillsdale, NJ: Erlbaum.

Spelke, E. S. (2000). Core knowledge. *American Psychologist, 55,* 1233–1243.

Spelke, E. S. (in press). Core knowledge, combinatorial capacity, and education: The case of number. In K. W. Fischer & T. Katzir (Eds.), *Building usable knowledge in mind, brain, and education.* Cambridge, England: Cambridge University Press.

Spencer, M. B., Brookins, G. K., & Allen, W. R. (Eds.). (1985). *Beginnings: The social and affective development of black children.* Hillsdale, NJ: Elrbaum.

Spiro, M. E. (1993). *Oedipus in the Trobriands.* New Brunswick, NJ: Transaction.

Spruston, N., & Kath, W. L. (2004). Dendritic arithmetic. *Nature Neuroscience, 7,* 567–569.

Sroufe, L. A. (1996). *Emotional development: The organization of emotional life in the early years.* Cambridge, England: Cambridge University Press.

Sternberg, R. J., Lautrey, J., & Lubart, T. I. (Eds.). (2003). *Models on intelligence: International perspectives.* Washington, DC: American Psychological Association.

Strauss, S. (with Stavy, R.). (Eds.). (1982). *U-shaped behavioral growth.* New York: Academic Press.

Tabor, L. E., & Kendler, T. S. (1981). Testing for developmental continuity or discontinuity: Class inclusion and reversal shifts. *Developmental Review, 1,* 330–343.

Tangney, J. P., & Dearing, R. L. (Eds.). (2002). *Shame and guilt.* New York: Guilford Press.

Tangney, J. P., & Fischer, K. W. (Eds.). (1995). *Self-conscious emotions: The psychology of shame, guilt, embarrassment, and pride.* New York: Guilford Press.

Tatsuoka, M. M. (1986). Graph theory and its applications in educational research: A review and integration. *Review of Educational Research, 56,* 291–329.

Terr, L. C. (1991). Childhood traumas: An outline and overview. *American Journal of Psychiatry, 148*(1), 10–20.

Thatcher, R. W. (1994). Cyclic cortical reorganization: Origins of human cognitive development. In G. Dawson & K. W. Fischer (Eds.), *Human behavior and the developing brain* (pp. 232–266). New York: Guilford Press.

Thelen, E., & Bates, E. (2003). Connectionism and dynamic systems: Are they really different? *Developmental Science, 6,* 378–391.

Thelen, E., & Smith, L. B. (1994). *A dynamic systems approach to the development of cognition and action.* Cambridge, MA: MIT Press.

Touwen, B. C. L. (1976). *Neurological development in infancy* (Vol. 58). London: Spastics International.

Turiel, E., & Davidson, P. (1986). Heterogeneity, inconsistency, and asynchrony in the development of cognitive structures. In I. Levin (Ed.), *Stage and structure: Reopening the debate* (pp. 106–143). Norwood, NJ: Ablex.

Uzgiris, I. C., & Hunt, J. M. V. (1987). *Infant performance and experience: New findings with the ordinal scales.* Urbana: University of Illinois Press.

Valsiner, J. (2001). The first six years: Culture's adventures in psychology. *Culture and Psychology, 7,* 5–48.

van Aken, M. A. G. (1992). The development of general competence and domain-specific competencies. *European Journal of Personality, 6,* 267–282.

van der Maas, H. (1995). Beyond the metaphor? *Cognitive Development, 10,* 631–642.

van der Maas, H., & Molenaar, P. (1992). A catastrophe-theoretical approach to cognitive development. *Psychological Review, 99,* 395–417.

van der Maas, H., Verschure, P. F. M. J., & Molenaar, P. C. M. (1990). A note on chaotic behavior in simple neural networks. *Neural Networks, 3,* 119–122.

van Geert, P. (1991). A dynamic systems model of cognitive and language growth. *Psychological Review, 98,* 3–53.

van Geert, P. (1994). *Dynamic systems of development: Change between complexity and chaos.* London: Harvester Wheatsheaf.

van Geert, P. (1998). A dynamic systems model of basic developmental mechanisms: Piaget, Vygotsky, and beyond. *Psychological Review, 105,* 634–677.

van Geert, P. (2003). Dynamic systems approaches and modeling of developmental processes. In J. Valsiner & K. Connolly (Eds.), *Handbook of developmental psychology* (pp. 640–660). Thousand Oaks, CA: Sage.

van Geert, P., & van Dijk, M. (2002). Focus on variability: New tools to study intra-individual variability in developmental data. *Infant Behavior and Development, 25*(4), 340–374.

von Bertalanffy, L. (1976). *General systems theory* (Rev. ed.). New York: Braziller.

Vygotsky, L. (1978). *Mind in society: The development of higher psychological processes* (M. Cole, V. John-Steiner, S. Scribner, & E. Souberman, Trans.). Cambridge, MA: Harvard University Press.

Wahlsten, D. (1990). Insensitivity of the analysis of variance to heredity-environment interaction. *Behavioral and Brain Sciences, 13,* 1–27.

Wallbott, H. G., & Scherer, K. R. (1995). Cultural determinants in experiencing shame and guilt. In J. P. Tangney & K. W. Fischer (Eds.), *Self-conscious emotions: The psychology of shame, guilt, embarrassment, and pride* (pp. 466–488). New York: Guilford Press.

Wallon, H. (1970). *De l'acte à la pensée* [From action to thought]. Paris: Flammarion.

Wang, L. (1997). *The development of self-conscious emotions in Chinese adolescents.* Unpublished doctoral dissertation, Harvard Graduate School of Education, Cambridge, MA.

Waters, E., Merrick, S., Treboux, D., Crowell, J. A., & Albersheim, L. (2000). Attachment security in infancy and early adulthood: A twenty-year longitudinal study. *Child Development, 71,* 684–689.

Watson, M. W. (1984). Development of social role understanding. *Developmental Review, 4,* 192–213.

Watson, M. W., Fischer, K. W., & Andreas, J. B. (2004). Pathways to aggression in children and adolescents. *Harvard Educational Review, 74,* 404–430.

Watson, M. W., & Getz, K. (1990). The relationship between oedipal behaviors and children's family role concepts. *Merrill-Palmer Quarterly, 36,* 487–505.

Welford, A. T. (1968). *Fundamentals of skill.* London: Methuen.

Wellman, H. M. (1990). *The child's theory of mind.* Cambridge, MA: MIT Press.

Werner, H. (1948). *Comparative psychology of mental development.* New York: Science Editions.

Wertsch, J. V. (1979). From social interaction to higher psychological processes: A clarification and application of Vygotsky's theory. *Human Development, 22,* 1–22.

Westen, D. (1994). The impact of sexual abuse on self structure. In D. Cicchetti & S. L. Toth (Eds.), *Disorders and dysfunctions of the self* (Vol. 5, pp. 223–250). Rochester, NY: University of Rochester.

Whiting, B. B., & Edwards, C. P. (1988). *Children of different worlds: The formation of social behavior.* Cambridge, MA: Harvard University Press.

Willett, J. B., Ayoub, C., & Robinson, D. (1991). Using growth modeling to examine systematic differences in growth: An example of change in the function of families at risk of maladaptive parenting, child abuse, or neglect. *Journal of Counseling and Clinical Psychology, 59,* 38–47.

Wilson, E. O. (1998). *Consilience: The unity of knowledge.* New York: Knopf.

Wittgenstein, L. (1953). *Philosophical Investigations* (G. E. M. Anscombe, Trans.). Oxford, England: Oxford University Press.

Wohlwill, J. F. (1973). *The study of behavioral development.* New York: Academic Press.

Wohlwill, J. F., & Lowe, R. C. (1962). An experimental analysis of the development of conservation of number. *Child Development, 33,* 153–167.

Wolf, M., & Katzir-Cohen, T. (2001). Reading fluency and its intervention. *Scientific Studies of Reading, 5,* 211–239.

Wolfram, S. (2002). *A new kind of science.* Wolfram Media.

Wundt, W. (1907). *Outlines of psychology* (C. H. Judd, Trans.). New York: Stechert.

Yakovlev, P. I., & Lecours, A. R. (1967). The myelogenetic cycles of regional maturation of the brain. In A. Minkowsky (Ed.), *Regional development of the brain in early life* (pp. 3–70). Oxford, England: Blackwell.

Yan, Z. (2000). *Dynamic analysis of microdevelopment in learning a computer program.* Unpublished doctoral dissertation, Harvard Graduate School of Education, Cambridge, MA.

Yan, Z., & Fischer, K. W. (2002). Always under construction: Dynamic variations in adult cognitive development. *Human Development, 45,* 141–160.

CHAPTER 8

The Person in Context: A Holistic-Interactionistic Approach

DAVID MAGNUSSON and HÅKAN STATTIN

THE ENVIRONMENT 402
THE GOAL OF SCIENTIFIC PSYCHOLOGY 403
A THEORETICAL FRAMEWORK: THE HOLISTIC-INTERACTIONISTIC MODEL 404
PERSPECTIVES 405
THREE GENERAL APPROACHES TO PERSON-ENVIRONMENT RELATIONS 405
Unidirectional Person-Environment Models 405
Classical Interactionism 406
Holistic (Modern) Interactionism 406
Comments 408
THE PERSON AS THE ORGANIZING PRINCIPLE FOR SCIENTIFIC INQUIRY 409
The Person as an Active Agent in the Person-Environment System 409
The Mediating Mental System 409
Behavior in a Holistic-Interactionistic Model 414
Biological Factors in the Person-Environment Interaction Processes 414
The Nature-Nurture Issue: Hereditary and Environmental Factors in Individual Development 416
Personality Consistency: A Matter of Person-Environment Interaction 418
Individuality: The Developing Person 419
Comments 420
THE ENVIRONMENT IN THE PERSON-ENVIRONMENT SYSTEM 420
The Concept of Context 421
The Environment in Developmental Research 421
Conceptual and Empirical Analyses of Environments 422
The Environment as a Source of Information and a Source of Stimulation 422
Optimal Environments 423
Formative and Eliciting Events 424
Significant Events 424
Proximal Dynamic Person-Environment Systems 425
The Family as the Environment in the Socialization Process 425
Peers 426
Distal Environments 428
The Environment as a Changing Stage for Individual Functioning and Development 428
Individual-Environment Synchronization 429
A Cross-Cultural Perspective 430
Summary 431
BASIC PRINCIPLES OF THE HOLISTIC-INTERACTIONISTIC MODEL 431
The Holistic Principle: From Variables to Individuals 431
Transformation; Emergence, and Novelty in Structures and Processes 433
Functional Interaction 434
Temporality 436
Organization 437
Integration of Processes: Synthesis 439
Summary 439
THEORETICAL AND METHODOLOGICAL IMPLICATIONS 439
Toward a Developmental Science 439
Methodological Implications—Looking for Mechanisms 440
Tools in the Acquisition of Information: Methods for Data Collection 440
Generalization 441
Measurement Models 443
Comments 447
Statistics 447
RESEARCH STRATEGY 448
A Multivariate Approach 448
A Longitudinal Design 448
Comment 449
Cultural and Cross-Cultural Research 449
Multidisciplinary Collaboration 449
Prevention, Treatment, and Intervention 450
CONCLUSION 451
The Mind: Worldviews and Self-Perceptions 452
REFERENCES 453

Since the birth of psychology as a scientific discipline, the central task has been formulated in various ways. Some of these formulations have greatly influenced both theory and empirical research by focusing on aspects of the functioning of the total human being. However, lack of consistency in the theoretical framework for what scientists claim is the same discipline that still exists and is a major cause of the fragmentation that characterizes research on psychological phenomena. More and more psychologists are becoming aware of the need for a general theoretical framework for designing, implementing, and interpreting studies of specific issues. This has been particularly evident in personality research (e.g., Cervone, 2004; Mischel, 2004). The aim of this chapter is to discuss this situation, identify its consequences by focusing on individual development, and suggest what can be done to promote further success in making developmental science a full member of the scientific family.

Focusing on that goal, the discussion in this chapter starts from the proposition that *the central task for scientific psychology is to contribute to an understanding and an explanation of why individuals think, feel, act, and react as they do in real life* (Magnusson, 1990). The discussion is based on the following propositions:

Proposition 1: The functioning and development of the individual is our main concern. However, an individual's current functioning and life-span development are not isolated from the environment in which he or she lives. A basic tenet for the presentation and discussion here is that the individual is an active, purposeful part of an integrated, complex, and dynamic person-environment (PE) system—the PE system. Consequently, it is not possible to understand how social systems function without knowledge of individual functioning, just as individual functioning and development cannot be understood without knowledge of the environment (e.g., Coleman, 1990). The fundamental implication for future psychological research is that we have to change the object of theoretical and empirical research from a context-free individual to a person who functions and develops as an active, intentional part of an integrated, complex PE system (e.g., Ryff, 1987).

Proposition 2: Within the PE system, the individual functions and develops as an integrated, indivisible whole. This circumstance has far-reaching implications for research on psychological phenomena.

Proposition 3: The proposed task requires a research strategy where results from single studies contribute to the synthesis of knowledge that is required for understanding why individuals think, feel, act, and react as they do in real life and how they develop in these respects.

Proposition 4: A basic requirement in such a research strategy is the application of a general theoretical model on individual functioning and development as a common framework for the design, implementation, and interpretation of studies on specific issues. This is characteristic of development in all scientific disciplines concerned with dynamic, complex processes.

These propositions are not new. They have been formulated before and are well known and widely accepted at the theoretical level. However, despite basic and far-reaching implications for theoretical and empirical research on developmental processes of individuals, their impact is limited in these respects. Our evaluation is that this circumstance is one cause of the fragmentation in what is normally designated developmental psychology. This chapter emphasizes the need for real consideration of the perspectives reflected in the propositions, in order to achieve real scientific progress in research on individual developmental phenomena.

The importance of an overriding, common theoretical frame of reference for scientific progress is demonstrated in the history of the natural sciences. In physics, the Newtonian model of the world served this purpose for a long time and formed the ground for the enormous success of research on the inanimate world. In the twentieth century, it was complemented by Einstein's relativity theory and by quantum theory; at present, theoretical physics is developing a general theory to overcome the incompatibility of the two: the string theory. For psychology, the theory of evolution presented by Darwin in 1859 as the framework for research on living organisms played a role closer to our current situation. An indication of the fundamental importance of a holistic frame of

---

This chapter is a revised version of D. Magnusson and H. Stattin (1998) "Person-Context Interaction Theories" published in the fifth edition of this *Handbook*. The chapter has been read and commented on by Lars R. Bergman, Jan Bergström, Michael Bohman, Magnus Kihlbom, Uno Lindberg, Ulf Lundberg, and Henry Montgomery. We are deeply grateful for their comments.

The work presented here was supported by grants from the Bank of Sweden Tercentenary Foundation, the Swedish Council for Social Research, and the Swedish Council for Planning and Coordination of Research.

reference for research in life sciences is the establishment of *Systems Biology*.

> Systems biology does not investigate individual genes or proteins one at a time, as has been the highly successful mode of biology for the last 30 years. Rather, it investigates the behavior and relationships of all of the elements in a particular biological system while it is functioning. (Ideker, Galitski, & Hood, 2001, p. 343)

In psychology, as a life science, a common frame of reference for the study of specific issues has the following main implications:

- Results of empirical studies on specific issues are necessary to build the synthesis of knowledge about the phenomena under investigation (e.g., Richters, 1997). The application of a general theoretical model implies, among other things, that results concerning specific aspects of the integrated individual acquire additional meaning compared to those without the common frame of reference. The whole is more than the sum of its parts. Others had seen before each specific aspect of nature that Darwin observed on his trip around South America. But it was not until Darwin systematized his observations and interpreted them in the general perspective of the holistic model of natural selection that they constituted the basis for the development of a general theoretical model of evolution, a model that could serve as the framework for the design, implementation, and interpretation of studies on specific issues. Accordingly, one of the most remarkable developments in the history of science was launched through Darwin's ingenious ability to systematize his observations into a general, holistic model (cf. Mayr, 2000a). As emphasized by scientists from very different perspectives, for further progress on the road to understanding and explaining how and why individuals think, feel, act, and react in real life, psychology is in the need of a general holistic framework. This need includes research on individual development.
- A basic requirement for scientific progress is communication between researchers investigating different but interdependent problems. A general theoretical framework offers a common conceptual space as a prerequisite for effective communication between researchers concerned with different issues at all levels of the phenomena involved in the processes under consideration. In natural sciences, a common theoretical framework allows astrophysicists to communicate with those concerned with problems at the atomic level, and vice versa. In his comments on scientific development, Montgomery (2004) notes that fragmentation results from a lack of coherent scientific models: "Language in science is in the midst of change and appears as dominated by two contradictory trends. Globalization of scientific English seems to promise greater international unity, while growth of field-specific jargon suggests communication diasphora" (p. 1333). To summarize: A general model for human functioning and development will help to overcome fragmentation in research by serving as a common theoretical framework for the specification of issues and the design and interpretation of empirical studies on specific phenomena and for effective communication among researchers on central issues.

THE ENVIRONMENT

In psychological research, the idea that individual functioning cannot be understood without considering the environment in which it occurs was explicitly expressed early on in Lewin's well-known formula $B = f(PE)$, when he focused on the individual's "life space" (Lewin, 1935, p. 11–12). However, the environment is a fuzzy concept with a variety of interpretations, and its application here calls for some specification. For a discussion of the environmental role in individual functioning and development, the environment can be ordered along the dimension of proximity to the individual's experiences. In the following discussion, three environmental positions along that dimension are distinguished: (1) the immediate situation, (2) the proximal environment, and (3) the distal environment.

An individual's current functioning always takes place in a situation with specific features. Individual functioning inevitably relates to specific situational conditions and cannot be understood in isolation from them. It is in momentary situations that we meet the world, form our conceptions of it, and develop our specific way of handling new situations. Individual experiences are fundamental for the developmental socialization process. Situations present—at different levels of specification—the information that we need to act adequately and they offer us the necessary feedback for building valid conceptions of the outer world. By assimilating new knowledge and experiences into existing

mental categories and by accommodating old categories and forming new ones, each individual develops an integrated system of mental structures involved in continuous interaction with the environment. On the basis of and within the limits of inherited dispositions, affective tones become bound to specific contents and actions, and strategies develop for coping with various kinds of environments and situations in a continuously ongoing learning process (Magnusson, 1981, p. 9). These formulations are linked to the analysis of current individual functioning across situations that is discussed later in the section titled: Individuality: The Developing Person.

This situation-bound process takes place in a variety of settings—at home, school, neighborhoods, clubs, or libraries, for example. Among other things, these settings offer opportunities for relationships with family members, peers, schoolmates, and other individuals. Together, these environmental elements with which the individual is or can be in direct contact, constitute what is discussed as the *proximal environment.* The proximal environment is to some extent individually unique, which is illustrated by research on the role of siblings in a later section.

Proximal environments are embedded in and dependent on the characteristic sociocultural and physical features of an environment at a more general level designated as the *distal environment.* The features of an individual's proximal environments are directly dependent on the features of the distal environment in which it is embedded.

Along the proximity dimension, the total PE system to which an individual belongs forms a hierarchic system in which immediate situations, proximal environments, and distal environments are integrated. The role of proximal and distal environments in the individual developmental PE interaction processes is discussed in the section titled: The Environment in the PE System.[1]

THE GOAL OF SCIENTIFIC PSYCHOLOGY

The goal of scientific work is to formulate the basic principles and specific mechanisms for how and why phenomena function as they do at various levels of complexity. This goal is as relevant to the study of human functioning and development as it is to the study of physics. The remarkable advances in the physical sciences, and the resulting rapid development of a highly technological society, have resulted in physics becoming the model for other scientific disciplines, including behavioral and social sciences. Unfortunately, other fields have sometimes adopted the goals and values espoused by physicists without considering whether the phenomena involved are congruent with the model that physics provides. For example, a central concept in the search for precise laws in the framework of the Newtonian mechanistic model of nature is "prediction." Ever since J. B. Watson (1913) defended psychology as a natural science by proposing that "prediction and control of behavior" are the goals of scientific psychology, accurate prediction has often been regarded as a main criterion for the validity of a scientific law in psychology. Fostered by the development and application of technically sophisticated statistical tools, prediction has also become a central goal for research on human ontogeny. The psychological importance of single variables or composites of variables in individual development is often measured by how well they predict later outcomes in statistical terms. The claim that prediction and control are central goals for developmental research continues to be espoused even in areas where it is not very appropriate.

Exact prediction of individual functioning and development as the ultimate goal for psychological research can be questioned for two interrelated reasons. The first has to do with individual functioning as integrated processes; the second concerns the laws that direct this type of processes.

One of the fundamental propositions behind modern models for dynamic complex processes is that these processes are guided by specific principles but tend to be unpredictable except under specific, restricted conditions (e.g., Kelso, 2001). Research on human functioning belongs to the "life sciences." The Nobel laureate Frances Crick (1988) discussed the kinds of laws sought in different disciplines and concluded that the phenomena that are studied in biological systems are such that the universally valid, strong laws that define physics are not applicable to biology. Mayr (1997), a leading biologist of the twentieth century, took the same position and concluded that biology needed to abandon the paradigm of classical physics to develop as a scientific discipline

[1] In this chapter, the concept "the physical environment" includes the biological components. In Western cultures, other individuals constitute the most important component. In other cultures, various forms of domestic and wild animals also contribute to form the integrated environment.

in its own right. As a life science, psychology has more to learn from biology than from physics.

In this perspective, the final criterion for success in our scientific endeavors is not how well we can predict individual behavior across different situations or over the life course, but how well we succeed in explaining and understanding the processes underlying individual functioning and development. The scientific goals for psychological research in general are then threefold:

1. To identify the factors operating in the integrated processes of human functioning and development. They may be mental, biological, and behavioral on the individual side and/or environmental components, depending on the nature of the process under investigation.
2. To identify the basic principles characterizing current functioning and developmental processes. This issue is discussed in a later section on individual development. Basic principles are general features that characterize developmental processes of all humans, independent of age, sex, and culture. For real scientific progress in research on individual development, these principles must be considered in specific theoretical and empirical research.
3. To identify the mechanisms by which operating factors work at the specific level of the individual in the framework of the PE system to fulfill their role in the integrated functioning of the individual (see methodologies and research strategies in a later section).

It should be emphasized that we take issue with prediction as the ultimate criterion for the scientific success of research on human functioning and developmental processes, not with prediction as a tool in a research design. The focus of the chapter is *individuality,* and a key concept in our discussion is *process.* Of course, prediction is a useful conceptual and methodological tool in an appropriate design for research on properly analyzed phenomena. The concept of prediction as a tool is also applicable in numerous practical situations to which psychological methods are being applied, for example, in personnel selection or decision making. In such situations, the certainty with which predictions are made, that is, the probability that certain events may occur, is of basic interest.[2]

[2] A problem with the concept of prediction in developmental research and in psychological research in general arises in discussions of empirical results by the use (or misuse) of the concept of prediction in two orthogonal meanings: (1) prediction of significant statistical relations, for example, between data for a predictor and data for a criterion; and (2) prediction of individual functioning. Significant correlation coefficients are very often discussed as if they could be interpreted as significant predictors of individual functioning. This is an unscientific misuse of statistics. It has been empirically demonstrated with solid data that even significant correlation coefficients of a size that are common in developmental research, cannot form the basis for that kind of conclusion (Magnusson, Andersson, & Törestad, 1993).

A THEORETICAL FRAMEWORK: THE HOLISTIC-INTERACTIONISTIC MODEL

Considering the central role of interaction in processes of living organisms, the general theoretical approach to the study of individual functioning and development comprises a holistic-interactionistic framework (Magnusson, 1995, 2001). Briefly, a modern holistic-interactionistic model emphasizes an approach to the individual and the PE system as organized wholes, functioning as totalities and characterized by the patterning of relevant aspects of structures and processes in the individual and in the environment. At all levels, the totality derives its characteristic features and properties from the functional, dynamic interaction of the elements involved, not from each isolated part's effect on the totality. Each component of the individual structures and processes that are operating, as well as each component of the environment, takes on meaning from its role in the total, integrated functioning of the individual (Magnusson, 1990). A striking example of this psychobiological process and its dependency on the characteristic context stimulation is the result of empirical research on olfaction presented by the Nobel laureates in medicine 2004, Richard Axel and Linda Buck (see, e.g., Buck and Axel, 1991). They showed that each specific scent is normally a mix of odorant molecules that activates a combination of different sensors—types of receptor cells that send their signal via the olfactory bulb to the cortex. The unique code that reaches the cortex makes us perceive a given odorant and assign meaning to it. Accordingly, the stimulating context must be structured and the biological system involved must be patterned in a unique way to make it possible for the individual to identify and give meaning to a certain odor.

It should be clear, and this is important for understanding its role in the research process, that the holistic-

interactionistic model is not an empty conceptual box: It has a substantive content of basic principles that characterize the processes of individual development in the same way that the basic principles of diversity and mutation do in the framework of natural selection. Basic principles in developmental processes are discussed in a later section.

PERSPECTIVES

An individual's thoughts, feelings, actions, and reactions can be the object of study from three complementary perspectives: synchronic, diachronic, and evolutionary. It should be recognized that the three perspectives are complementary, not contradictory. This chapter focuses on the diachronic perspective; that is, the developmental processes of individuals. The holistic-interactionistic perspective of individual functioning in a synchronic perspective was reviewed and discussed in Magnusson (1990) and Magnusson and Törestad (1993) and the interested reader is referred to those articles. In the following presentation, current functioning is included when it is appropriate. The evolutionary perspective is not considered here.

Research on psychological phenomena in a synchronic perspective is concerned with the processes of thoughts, feelings, actions, and reactions within the framework of existing mental, biological, and behavioral structures. Accordingly, "synchronic" models analyze and explain why individuals function based on their contemporaneous mental, behavioral, and biological states and independent of the developmental processes that may have led to the present state of affairs (e.g., most cognitive models). In contrast, "diachronic" models analyze current functioning in terms of the individual's developmental history. They are concerned with how relevant aspects of the individual and his or her environment have operated in the process leading to the current functioning.

Research on individual development refers to changes in mental, behavioral, and/or biological factors that are involved in the integrated processes of individual current functioning. In its most general form, development of an organism refers to any progressive or regressive change in size, shape, and/or function. Research on individual development is concerned with this process over the life span, from conception to death (Baltes, Lindenberger, and Staudinger, 1998; Cairns, 1998; Overton, 1998; Valsiner & Conolly, 2003, presented elaborated overviews and discussions of the concept of development, its theoretical, conceptual, and methodological implications).

THREE GENERAL APPROACHES TO PERSON-ENVIRONMENT RELATIONS

At a metatheoretical level, three general approaches to the study of person-environment relations in individual current functioning and development can be distinguished: (1) unidirectional causality, (2) classical interactionism, and (3) modern interactionism, here designated holistic interactionism. Each has its specific implications for theory building and for implementation and interpretation of empirical studies.

Unidirectional Person-Environment Models

The traditional view of the role of the environment in developmental processes has two interrelated characteristics. First, the individual and the environment are regarded, discussed, and treated as two separate entities. Second, the relation between them is characterized by unidirectional causality: The individual is the target of environmental influences. The view is reflected in theories and models at all levels of generality, from Marxist models for society to S-R (stimulus-response) models for very specific aspects of behavior studied in the mainstream of experimental psychology. Seemingly, very different theories adhere to this approach. According to classical psychoanalytical theory, the life course of an individual is under the unidirectional influence of the parents' treatment of the child during infancy. Watson (1930), in his discussion of individual development in a behaviorist perspective, gave the environment a decisive role in the processes of an individual development. Even in developmental theories that did not refer to a behaviorist or psychoanalytic view, the family was usually regarded as influencing the child in a unidirectional way during the socialization process from infancy through adolescence. The unidirectional approach is also manifested in research designs that employ concepts of prediction, independent and dependent variables, and predictors and criteria.

Adopting a psychometric variable approach in empirical research on the relation between environmental factors as independent variables and person characteristics as outcome variables has a long tradition. Good

examples are found in educational research on the role of the home background for individuals' educational and vocational career. In studies on the role of the environment for children and their socialization processes, the possible impact of the family has been a central topic. An example of this line of research was presented by Baumrind (1971). She distinguished between three groups of parental attitudes that influenced children's behavior: authoritative, authoritarian, and permissive. The influence of children's behavior on the parenting was not considered—child behavior was an output of parental practices.

Classical Interactionism

The central idea of classical interactionism is expressed in the formula $B = f(PE)$; that is, individual functioning is the result of the interplay of individual and environmental factors. This implies that interest focuses on the interface of person-environment relations. In contrast to the traditional unidirectional view, the classical interactionistic formulations emphasized that a characteristic of the relations is reciprocity (e.g., Endler & Magnusson, 1976).

Particularly during the 1970s and 1980s, the explicit formulations of a classical interactionisitic model exerted a twofold impact on personality research, besides having implications for planning, implementing, and interpreting developmental research. First, the issue of cross-situational consistency in individual current functioning became a central topic for theoretical debate (e.g., Magnusson & Endler, 1977; Mischel, 1973). Second, this debate accordingly led to an interest in theoretical taxonomies and empirical analyses of contextual characteristics (see Forgas & Van Heck, 1992; Magnusson, 1981).

In very general terms, classical interactionism has old roots. An early proponent of an interactionistic position was Wilhelm Stern (1935). He defined the arena for the reciprocal person-environment interaction as the person's "biosphere" or "personal world" (cf. Kreppner, 1992b). Baldwin had discussed ontogenetic and evolutionary development in such terms in the 1890s. And as suggested by Cairns and Cairns (1985), there is a direct line from Baldwin to Piaget, Kohlberg and others who have influenced various areas of developmental research. A major step forward in the application of an interactionistic view in empirical developmental research was the publication of two articles by Bell (1968, 1971), stressing the bidirectional relation between parents and their children. The reciprocity in mother-child relations was also stressed by Ainsworth (1983) in her discussion of attachment. This line of research has been followed up and summarized by Kerr and Stattin (2003).

Since the 1970s, most developmentalists have accepted the role of person-environment reciprocal interaction theoretically. Reciprocity in interpersonal relations has been a building block in many theoretical developmental models. Historically, from Bowlby (1952) onwards, developmentalists have employed terms that expressed the interdependent, reciprocal character of social interactions. However, while reciprocity was acknowledged in theory, the reciprocal nature of the concepts has often been lost in actual assessments. Leading developmental researchers have used different terms to identify this view.[3]

Holistic (Modern) Interactionism

According to a holistic-interactionistic perspective, psychological events reflect two interdependent levels of individual processes: (1) The continuously ongoing interaction processes between individual and environmental factors, and (2) the continuously ongoing processes among psychobiological and behavioral components in the individual. The view differs from classical interactionism in two respects. First, holistic interactionism emphasizes more strongly the holistic, dynamic character of individual functioning and of the total PE system, both in a current and developmental perspective. Second, it incorporates both biological

[3] As reported above, different concepts and formulations have been proposed and used for what is here designated "interaction" and "interactionism," including "transaction,""reciprocal determinism," "dialectic-contextualistic," "process-person," and "developmental dualism." Our reason for using the terms interaction and interactionism is that in all other life sciences these terms are well established as representing a fundamental aspect of the life processes of living organisms (e.g., Lindberg, 2000). In social ecology, the interaction concept is a fundamental one. In our view, it can only be harmful and detrimental to scientific progress in our own discipline, which is dependent on collaboration with neighboring sciences for successful scientific progress, if we continuously invent and apply new terms instead of adopting concepts that are already well established in disciplines with which we want to collaborate.

processes and manifest behavior into the model in a systematic, explicit way.

An essential aspect of a holistic-interactionistic model is that at all levels of the PE system, from the macro- to micro-level of cell systems, the operating components function and develop as integrated systems. Accordingly, the way integrated processes function and change is dependent on the interaction among all involved elements, vertically and horizontally, in the hierarchical organization of the organism. This proposition has decisive implications for effective methodology and strategy in research on human ontogeny (see the Methodological Implications section).

Holistic interactionism rests on five basic propositions:

1. The individual is an active, intentional part of a complex, dynamic PE system.
2. The individual functions and develops as a total, integrated organism.
3. Individual functioning in existing psychobiological structures, as well as developmental change, can best be described an integrated, complex, and dynamic processes.
4. Such processes are characterized by continuously ongoing interactions (including interdependence) among mental, behavioral and biological components of the individual and social, cultural, and physical components of the environment.
5. The environment functions and changes as a continuously ongoing process of interaction and interdependence among social, cultural, and physical factors.

The holistic-interactionistic model, summarized in the five propositions, has been fertilized from various sources at a rapidly increasing pace, largely as a result of scientific progress in neighboring life sciences (e.g., Magnusson, 1999a). Research on psychobiological and behavioral components of individual functioning and development have contributed to form a model that can serve as the framework for the design, implementation, and interpretation of empirical studies on specific issues. Modern models for dynamic processes, developed in natural sciences, have enriched the holistic-interactionistic framework, both theoretically and methodologically. Well-planned longitudinal studies have demonstrated the uniqueness of individual developmental processes. This has strengthened the notion of a holistic-interactionistic view as essential for understanding the mechanisms at work in the lifelong developmental processes of individuals.

An individual continuously encounters new situations implying new demands, threats, opportunities, and so on. In the process of interaction with the environment, the organism must maintain its integrity and the equilibrium of its internal regulations under varying conditions, even extremes. This adaptation process in each specific situation depends on mental, biological, and behavioral repertoire interaction of the individual, on the one hand, and the situational conditions, on the other.

An illustration of the interaction process in which psychobiological, behavioral and social factors are involved is seen when an individual interprets a situation—at work, during leisure time, and so on—as threatening or demanding. The cognitive act of interpreting the situation stimulates, via the hypothalamus and amygdala, the excretion of adrenaline and cortisol from the adrenal glands, which in turn triggers other physiological processes. The cognitive-physiological interplay is accompanied by emotional states of fear or anxiety and/or generally experienced arousal. Next, these emotions affect not only the individual's behavior toward and handling of the environment, but also his or her interpretation and expectations of sequences of changes in the situational conditions and, thereby, his or her physiological reactions during the next stage of the process.

The example illustrates how psychobiological components of the individual and components of the situation are involved in a continuous loop. The way this process goes on is contingent on, among other things, the environment as it is perceived and given meaning by the individual. The outcomes of such situation-individual encounters set the stage for subsequent actions and reactions to psychologically similar situations, as interpreted by the individual. The application of this perspective is illustrated in the discussion of stress research by Appley and Turnball (1986; e.g., Warburton, 1979, discussing physiological aspects on information processing and stress). In processes over time, this interaction involves the mental system (in its interpretation of certain types of situation), the physiological system, and the behavioral responses to such and similar situations.

Of particular interest in the holistic-interactionistic model is the role played by the individual's interpretation of what happens in the proximal environment and expectations about possible outcomes of his or her own actions. The appraisal of external information guides thoughts and actions and evokes physiological systems

that influence psychological events, thoughts, feelings, emotions, and actions. The individual's interpretation and appraisal of stimuli and events in the environment form an essential element in theorizing and empirical research on coping and adaptation (e.g., Smith & Lazarus, 1990).

Elements of a holistic-interactionistic model for individual development have been presented for some time. Influential forerunners of this view were Kuo (1967) and Schneirla (1966). Those who have contributed to the formulations of the holistic view include Cairns (1979, 1996), Gottlieb (1991, 1996), Lerner (1984, 1990), Magnusson and Allen (1983a, 1983b), and Sameroff (1989), among others. Brooks-Gunn and Paikoff (1992) argued for an integrated approach to the study of the socialization process, an approach that takes into account biological, affective, cognitive, and social factors. The bio-ecological model presented by Bronfenbrenner and Ceci (1994) is basically in line with the tenets of holistic interactionism. An application of the modern/holistic-interactionistic view in a specific field is found in Thelen's (1995) presentation of a new synthesis of motor development. Karli's (1996) presentation of an integrated, holistic bio-psychosocial approach to the development of aggressive behavior is in keeping with holistic interactionism. The same is true of Susman's (1993) discussion of the developmental processes underlying conduct disorder. Recently, Li (2003) and Baltes and Smith (2004) discussed the main features of a holistic-interactionistic view as a biocultural model.

The necessity—for a proper understanding of developmental processes—of considering the interplay of psychobiological, behavioral and social factors in a holistic-interactionistic framework is illustrated by examples from the Individual Development and Adapation (IDA) longitudinal study of Swedish children (Magnusson, 1988; Magnusson, Stattin, & Allen, 1985; Stattin & Magnusson, 1990). A complete cohort of boys and girls in a community in Sweden was followed from the age of 10. At the average age of 14.5 for girls, quite strong correlations existed between the age of menarche and data for aspects of norm-breaking behavior, school adjustment, and parent and teacher relations. For example, girls maturing very early reported much greater alcohol use than later-maturing girls. They also reported more strained parent and teacher relations and adjusted less well to school. Interpreted in a cross-sectional perspective, this result indicated that a group of girls at risk for antisocial development had been identified.

However, when the same girls were followed up at the age of 26 to 27, no systematic relation was found between age of menarche and drinking. On the other hand, very early biological maturation did have consequences for education, family, children, and job status. The girls who matured very early had more children and had completed less education than average or late maturing girls. These effects could not be attributed to early maturation only; rather, they were the net result of a web of interrelated factors, linked to biological maturation during adolescence: self-perception, self-evaluation, and, above all, the social characteristics of close friends. Girls with an early biological development perceived themselves in mid-adolescence as psychologically more mature than age-mates and associated more with chronologically older peers and boy friends (cf. Galambos, Kolaric, Sears, and Maggs, 1999). Briefly, they encountered a much more advanced social life, including what is regarded as norm-breaking behavior, than their later maturing age-mates (e.g., Caspi, Lynam, Moffitt, & Silva, 1993).

An essential point is that the onset of sexual maturity alone does not account for the observed short- and long-term consequences. Early biological maturation provided predisposing conditions for the integrated process involving individual mental and behavioral components, and social components in the environment. The current functioning of the girls during adolescent transition and its implications for their life history are dependent, among other things, on a combination of (a) early biological maturation, (b) easy access to older associates in the proximal environment, and (c) the dominant norms and rules in the proximal and distal environments.

Comments

Two comments are pertinent:

1. At a general level, the three approaches to PE relations reflect a historical development, in essential respects dependent on the scientific progress in other life sciences, including medicine. For example, in 1943 Clark Hull in a much-cited article in *Psychological Review* concluded that available knowledge about internal individual processes was too limited to serve as the basis for scientific analysis of them and sug-

gested that for the time being psychological research had to be restricted to the study of "molar behavior." As an effect of the rapid progress in human biology, Roger Russell in an APA presidential address in 1969, suggested, with reference to Clark Hull: "The situation is now different and is changing so rapidly that the psychologist is hard pressed to keep abreast of even those major developments in other biological sciences that are most relevant to his area of primary competences" (Russell, 1970, p. 211). Similarly, contemporary developments in the field of cognition, including information processing, learning, and memory, paved the way for the formulation of the holistic-interactionistic model.

2. What has been described here as three approaches to the study of PE relations reflects a characteristic feature of normal scientific development. Although none of them define an approach with very strict boundaries, either historically or contemporaneously, all three approaches still exist and are useful for different purposes, depending on the aim of the study and the characteristics of the phenomena under investigation. Individual contributors preceded the introduction of the holistic-interactionistic approach, more or less explicitly.

   The present distinction between the three approaches is not intended to be a comprehensive discussion of approaches to research on PE relations; it serves our purpose of proposing the holistic-interactionistic perspective as a necessary complement to the earlier models, as the basis for a general model of the functioning and development of the individual in the environment.

THE PERSON AS THE ORGANIZING PRINCIPLE FOR SCIENTIFIC INQUIRY

As we emphasized earlier, the individual functions and develops as an active, intentional part of an integrated PE system. This implies that the central issue for psychological theoretical and empirical research is not how the person and the environment interact as two separate parts of equal importance. It is how individuals, consciously and subconsciously, handle and adept to current situational conditions and how they develop over the life course in this respect. A basic proposition for the analysis is that individual development is not *determined* by but *dependent* on the environment.

The Person as an Active Agent in the Person-Environment System

The view of the individual as active and purposeful is not new. The dynamic conception of the mind and mental processes as activities, rather than as an organ receiving and processing information, was advocated by *the act psychologists* in Europe such as Brentano (1874/1924) and Stumpf (1883). In the United States, James (1890) was a proponent of the same view. The intentional nature of the individual's way of functioning, that formed a central element in Brentano's view, was also stressed by Tolman (1951) in his focus on purposive behavior. More recently, the individual as an active, purposeful agent has been emphasized in action theory (e.g., Brandtstädter, Chapter 10, this *Handbook,* this volume).

The Mediating Mental System

The view of the individual as the active, purposeful agent in the person-environment interaction process implies that a guiding principle in the individual's inner life and in his or her dealings with the external world resides in the functioning of the integrated mental system, including self-perception, perception of others, and worldviews, organized in schemata and plans. This proposition is reflected in the proposals to conceptualize personality as a goal-directed, adaptive open system (e.g., Allport, 1961; Hettema, 1979; Schwartz, 1987).

The mental system, based on brain activity, serves as a leading edge for adaptation in individual development in that it mobilizes neurobiological and physiological modifications. By selecting and interpreting information from the external world and transforming the information into internal and external activities, the mental system permits the organism to shape its effective environment and provides a rapid and reversible strategy whereby the organism can adapt to changing environments (e.g., Lerner, 1990; Nelson, 1999b).

Brain research has emphasized the role of the amygdala in mental processes. In a discussion of empirical studies on social phobia, Stein, Goldin, Sareen, Eyler Zorilla, and Brown (2002; see also Blumberg et al., 2003, for a discussion of the amygdala in adolescents with bipolar disorder) concluded:

> New leads for understanding the etiological substrates for social phobia have come from the basic and cognitive neurosciences. These studies have focused attention on the role of the amygdala and its rich networks of connections with other cortical and subcortical regions in the mediation of fear and anxiety. . . . Of particular relevance to social phobia, the amygdala is also thought to play an important role in the circuitry of social intelligence. Humans with bilateral amygdala damage are unable to make accurate social judgments of others. (p. 1027)

A central role for the view presented here is played by research on sensory perception and the functioning of the brain in the interpretation of information from the external world (e.g., Jeeves, 2004). In contrast to the mainstream traditional position, input into sensory processes is regarded as information that is interpreted and integrated by the brain and used in coping with internal and external problems rather than merely as stimulation of the sensory organs. The sensory organs function more as sensory systems than as independent sensory structures and the brain as a whole works as a pattern recognizer rather than as a device for measuring absolute magnitudes (e.g., Boncinelli, 2001; Tononi & Edelman, 1998). Vision, for example, is an active process of the brain, not a passive, reactive process (e.g., Popper & Eccles, 1977; Roland, 1993).

Subconscious Processes

A central concept in some psychodynamic models of the individual has been that of subconscious processes. The debate on this issue has been stimulated in recent decades by the growing interest in and understanding of the parallel processes of controlled (conscious, attended to, and thus subject to critical analysis) versus automatic (out of attentional focus and awareness) information processing (e.g., Kihlstrom, 1990; Öhman, 2002). One of the most important elements of subconscious processes is *expectation* in two interdependent respects: (1) expected outcomes of own activities in the present situation, and (2) general expectations about the environment in which the situation is embedded.

The role of subconscious processing of environmental information in the individual's adaptation to varying conditions was suggested by Sells (1966) in his analysis of feedback mechanisms in the adaptation process. Greenwald and Banaji (1995) discussed the role of subconscious processes in social cognition. It has also been suggested that unrecognized cognitive dysfunctions interfere with the socialization process (Buikhuisen, 1982), inhibit social adaptation, and promote delinquency in juveniles (Buikhuisen, 1987). Understanding the continuously ongoing processing of signals impinging on the senses out-of-awareness imparts new significance to the perceptual-cognitive system without necessarily referring to psychoanalytical concepts; at the same time, it reduces the central role earlier ascribed to conscious functioning.

Values, Valuations, and Norms

A central, sometimes decisive role in the mediating, mental processes that guide a person's purposeful dealing with the environment is played by the basic values, beliefs, norms, goals, and motives that are relevant for the particular issue under consideration (e.g., Eccles & Wigfield, 2002). In their discussion of the feedback processes underlying goal-directed action of an individual, Carver and Scheier (1998) stated: "Though not constituting the *whole* of the feedback loop, a goal is *essential* to the feedback loop" (p. 4).

The value structure underlies and influences the short- and long-term goals that direct an individual's thoughts and actions in current situations (Pervin, 1983). Max Weber, in his analysis of Protestantism and capitalism, made the implicit assumption that the individual's purposive, goal-directed activity is shaped by underlying values and preferences (e.g., Coleman, 1990). The history of politics and religion is full of illustrations of the strong impact of values and valuations on the functioning of individuals, organizations, and societies, reflected in attitudes, traditions, and conflicts. An elaborate model for how personal and social values, through attitudes and subjective norms, affect behavioral intentions and actions in a current perspective was presented in Fishbein and Ajzen's theory of reasoned action (Ajzen & Fishbein, 1980).

Values and valuations have a strong position in the integrated mediating system, both in guiding daily interests and activities, and in the organism's processes of maintaining continuity and stability in the individual's way of dealing with the environment. In a longitudinal study, Stattin and Kerr (2002) examined two types of value orientation in adolescents: "self-centered" (referring to concern primarily for one's own needs and enjoyment) and "other-centered" values (referring to concern for others' well-being and the common good).

Data for each of these groups showed coherent but different sets of correlations to various aspects of the adolescent life situations. More than 20 years after the first observation, other-focused values, relative to self-focused values, in adulthood were related to (a) stronger interest in other people, preference for being together with others, and a need to affiliate with other people or higher sociability; (b) more attached, than detached, interpersonal style; and (c) more warm and caring partner relations and a better family climate.

Overall, values and valuations can be seen to have a co-coordinating role, underlying functioning and development in diverse domains with implications for the life situation later on. This does not mean that values have a unidirectional impact on behavior. Values as well as cognitions, emotions, norms, and attitudes are part of the individual acting as a whole. At the same time, they are an effect of experiences and socialization, on the one hand, and influence the selection and interpretation of information from the external environment, on the other. For developmental research, the role of values and valuations in the socialization process and the role of various agents in the transfer of values and norms to youngsters should be highly central issues (Costanzo, 1991). This topic was addressed by Stattin, Janson, Klackenberg-Larsson, and Magnusson (1995), when concerned with how parents' punishment practices were reflected in their children's behaviors after they became parents.

Self-Consciousness, Self-Perceptions, and Self-Evaluations

In the processes of the individual's inner world as well as in his or her dealings with the environment self-consciousness—including self-perceptions and self-evaluations—is an important aspect of the mental system. James (1890) devoted a whole chapter to this issue (e.g., Epstein, 1990). In addition, in *The Wonder of Being Human: Our Mind and Our Brain,* the Nobel laureate John Eccles and Donald Robinson (1985) used the term "self-conscious mind" for what they saw as the highest mental experiences and discussed the emergence of self-consciousness and analyzed it as a central element in the brain-mind processes.

An expanding body of research has demonstrated that the ability of individuals to adjust to and cope with their environment depends on their beliefs and trust in their capacities, as was empirically demonstrated in a longitudinal study of females' educational careers (Gustafson & Magnusson, 1991). What matters are individuals' internal representations of situation-outcome contingencies and the mental representations of their roles as active participants in exercising control (e.g., Bandura, 1997). Children's experiences of handling their environment, of perceived control and predictability, have consequences for their view of themselves as (a) competent or noncompetent or as confident or non-confident in their abilities, (b) for their motivation to cope with demands of particular situations, and (c) for mobilization of behavioral and emotional resources. Harter (1990) described the prototype of the child with high self-esteem as the child who is confident, curious, takes initiatives, tolerates frustrations, and adjusts to environmental changes.

The development of the individual's self-perception, self-evaluation, and self-respect forms a main element in the process of learning and experience through which he or she gains the ability to exert predictive and active control over the environment (Bandura, 1977; Brandtstädter, 1993; Harter, 1983). The issue of personality and self in a developmental perspective is dealt with comprehensively by Baltes, Lindenberger, and Staudinger (Chapter 11, this *Handbook,* this volume). Pulkkinen and Rönkä (1994) empirically investigated the relation between self-identity in personal control over development and future life orientation and the role of school achievement, school success, and socioeconomic status in the home for these developmental aspects. In an article on the interaction between the self and the environment, Karli (2000) analyzed the interconnected brain regions that are involved in the socially adaptive functions of affect and emotion.

During developmental transitions, a central role is played by self-definitions in relation to formal and informal environmental age-graded developmental norms and expectations. Recent studies have convincingly shown that teenagers are well aware of whether they are "early," "on time," or "late" with respect to behaviors, such as formal age-prescribed behaviors and other less formal behaviors, connected with periods of transition; for example, time to be in at evening, bedtime, spending money, choosing clothes, and so on (e.g., Brooks-Gunn & Petersen, 1983). Stattin and Magnusson (1990) found that the definition of oneself as "early" among mid-adolescent girls tended to be associated with perceiving oneself as popular among boys, having more advanced drinking habits, more norm-breaking behaviors, but also

more school adjustment problems, and more psychosomatic and depressive reactions. Studies in Norway and Germany (Alsaker, 1995; Silbereisen & Kracke, 1997) have also demonstrated that self-definitions of oneself as being early maturing go hand-in-hand with engaging in more socially advanced behaviors in adolescence.

In his studies of illiterate inhabitants of isolated villages in Uzbekistan, Luria (1976) empirically demonstrated the basic role of culture in the development of individual self-perceptions. Brooks-Gunn and Paikoff (1992) dealt with this issue in their integrated approach to an analysis of what they designated "self-feelings" during the adolescent transition period.

Language and Language Acquisition

A crucial factor in processes of individual functioning and development is language and language acquisition. In a current perspective, access to a functional language plays a fundamental role for internal processes such as thinking and abstraction, as well as for behavior, for example in social contexts, regardless of cultural context, age, and level of intelligence. Access to a functioning language is central for the individual's interpretation of meaning in the environment. Language acquisition in the development of thinking was a central issue for Piaget (1964). In his empirical study of isolated and illiterate Uzbekistanis, Luria (1976) observed the link between access to linguistic ability and abstract thinking. The main topic of *Science* in February 2004 "Evolution of Language" is an indication of the current interest in this area from a broader scientific perspective. Recent research on individual language and language acquisition was summarized by Tomasello (1999; see also Lundberg, 2006).

Emotions

Everyday experiences show the importance of affective tones attached to inner life and external activities, with effects on our own behaviors and the behaviors of others. Scientists have recognized this in discussions of the human nature since ancient times. Darwin (1872) devoted a book to this issue, *The Expression of Emotions in Man and Animals* and William James in *Principles* (1890) discussed emotions and their relations to biological processes. From this perspective it is noteworthy, how empirical research on emotions was underestimated in the postwar period until the final decades of the twentieth century. A central role in the revival of research on emotions has been played by the work that has been presented, in the tradition of William James, on the connection between emotions and brain functioning. Research by Damasio (2003), LeDoux (1996), and others, has increased our knowledge of the role of feelings and emotions in the functioning and development of the mental, mediating system and their bases in brain processes. There is a growing interest in the role of emotions in decision making (see, e.g., Schwartz, 2000).

In an overview of research on emotional development during infancy and childhood, Thompson (2001) made a distinction between the structural perspective, in which emotions are analyzed by discrete states, and a functionalist perspective, questioning that emotions can be properly discussed as a package of elements. With reference to the latter view, he suggested what, in principle, is a holistic approach to the study of emotions and feelings in a developmental perspective:

> In this regard, what defines an emotion is not a network of internal subjective, physiological, and other components, but rather the constellation of a person's goals, appraisals, action tendencies, and other capacities in relation to environmental incentives, obstacles, and opportunities. (Thompson, 2001, p. 73–83)

Similarly, Forgas (2002) argued for a "multiprocess theory" when he discussed the role of affects in interpersonal processes. Tracy and Robins (2004) indicate the growing awareness of the integrated nature of individual mental life, focusing on self-conscious emotions, such as shame and pride, in contrast to "basic emotions," such as sadness and joy (cf. Damasio's, 2003, distinction between feelings and emotions).

Motivation

One of the most important concepts in individual functioning and development is that of motivation, closely connected with goals, values, emotions, and actions. Motivation is a fundamental issue for understanding human functioning and development: In everyday life, it is easy to recognize motivated individuals. Since the first centuries A.D., motivation has been a central topic in models of learning and education. A renewed interest has been demonstrated in several ways: For example, in modern action theory it has become a central topic, and there was a recent issue of *European Psychologist* focused on motivation and learning in different contexts (see Järvelä & Volet, 2004). Another issue of the same journal was devoted to the central issue of motivation and affect in self-regulation of behavior (Efklides,

2005). With reference to its role in delinquency, McCord (1997) suggested what she designated a construct theory of motivation.

Development of the Mediating Mental System

The way an individual's integrated mental system functions in a specific situation is the result of previous developmental processes of experiences and maturation. These processes take place within the limits of his or her constitutional dispositions in a continuous process of interaction with the physical, social, and cultural environment. The individual develops, in close interaction with environmental characteristics, an integrated cognitive, emotional system by assimilating new knowledge and experience into existing structures and accommodating old structures and forming new ones. Accordingly, the development of the brain is a fundamental topic for the discussion of appropriate models of individual functioning and development. "Neural circuits must be assembled with great precision in order to transmit and process information correctly" (Pasquale, 2000).

As a result of the PE interaction process, the characteristics of the mediating system in a person, and of its way of functioning (the specific cognitive structures that are built up, the specific contents of the structures, the affective tones bound to the structured contents, and the coping strategies), will depend on the environment encountered by the individual in the developmental process. The basic role of cultural factors in the establishment and use of an effective mediating system was empirically demonstrated by Luria (1976) in collaboration with Vygotsky. He showed how illiterate people living in isolated villages developed a mediating system and a language that hampered their ability to interpret the environment in abstract terms and to express self-perceptions and perceptions of others. Examples of the necessity of human contacts in the acquisition of language and other aspects of the socialization process are found in the documented cases of children who grow up without contact with other humans (McCrone, 1993). Altogether, these examples support the conclusion that while the human being is born with great biological (genetic and constitutional) potentials, the nature of the individual's functioning during all stages of the life course is dependent on his or her experiences, gained from the position in the integrated PE system.[4]

[4] An evolutionary perspective on the development of human speech was presented by Holden (2004).

The cultural dependency of mental processes was empirically illustrated by Irvine (1969): The concept of intelligence as defined in Western cultures had to be revised before intelligence tests could be used for comparing mental abilities in different ethnic groups (see also R. J. Sternberg, 2004). The experiences reported by Alistair Heron, the first professor of psychology in Africa in the 1960s, demonstrated that cultural factors are also important for sensory perception. He found that traditional culture-free tests did not function well in the contemporary African culture because these tests used figures in which angular corners played an important role, while boys and girls in traditional African villages lived in an environment in which everything was rounded. Ironically, when the "culture-free" tests were adapted to the environmental characteristic of the children's upbringing, the results were compatible with findings in Western cultures (personal communication to the first author).

To the extent that environments in which we are reared are similar, the main characteristics of our world conceptions have common characteristics. When the environments differ markedly, as between cultures, the total mediating system and the resulting interpretation of the environment also differs. In a series of cross-cultural studies of anxiety-provoking situations, systematic differences were found for children and youngsters in this respect (Törestad, Olah, & Magnusson, 1989). To the extent that interpretations of the outer world guide behavior, cross-cultural differences in actual behavior can be understood even in situations that are objectively similar. Valsiner and Lawrence (1996) analyzed the issue of individual development in cultural contexts, emphasizing the importance of making interacting person-culture systems the object of analysis (see also the discussion of development in the perspective of cultural psychology; Schweder et al., 1998).

Even children reared in the same family may not have identical physical and social environments. The proximal environments experienced by early and late born children may differ radically, due to the order of the children, differences in family relationships, and changes in the family's socioeconomic conditions (e.g., Dunn & Plomin, 1990). These circumstances contribute to inter-individual differences in conceptions of the outer world, and thus to differences in the interpretation of single situations, even among children who have grown up in the same proximal environment.

Comments

Cautions are advocated when components of the mediating system are the target of theoretical and empirical analyses. The foregoing discussion of various facets of the mental system uses a number of concepts, some of which reflect hypothetical constructs such as values, goals, norms, attitudes, and self-perceptions. When using such concepts it is easy to fall into the trap of reification, to forget that these constructs are only abstractions covering different aspects of an organism that functions as an organized whole. Perceptions, cognitions, emotions, values, norms, and attitudes are components of the same integrated process.

There are empirical studies to support the old idea that knowledge is acquired, not innate (Locke, 1690). In addition, the brain we are born with has properties that offer both potentials and restrictions for developmental processes. What becomes of a newly born fetus over the lifetime is the result of a continuous interaction process involving person-bound factors as well as factors in the proximal and distal environments. In this section, we have drawn attention to basic aspects of the functioning and development of individual mental life. To understand the functioning of an individual's mind and its role in the functioning and development of the integrated individual, all these aspects must be incorporated in a general model. (From different perspectives, an enormous number of theoretical and empirical studies have reported on what has been briefly reviewed here. Neither the space available nor our competence permits an exhaustive treatment of the field. The references given here do not do justice to all the relevant reports. They should be regarded as suggestions for further reading. Harré & Gillett, 1990, among others, provided an overview of the main topics discussed here.)

Behavior in a Holistic-Interactionistic Model

In the unidirectional models of individual functioning, behavior is usually regarded as just an outcome. A holistic-interactionistic model, however, views behavior in all its manifestations, including verbal and motor behavior, as playing an essential role in the current person-situation interaction, as well as in the processes of individual development.

As previously illustrated, if an individual interprets a situation as demanding or threatening, the individual's manifest behavior is an element of a continuously ongoing interaction process. It also serves to change the nature of the total PE interaction process in two interrelated respects. First, activities serve an important function for the individual, for example, by changing the situational conditions to satisfy personal short- and long-term needs and to avoid negative mental or biological experiences. Second, by his or her own behavior, a child contributes to his or her own social environment; by adapting to other individuals' behavior, the child develops and maintains effective social relations (Cairns, 1986a).

It should be observed that individual behavior in a specific situation with its specific characteristics is not solely dependent on the individuals' latent dispositions as reflected in trait measures. The behavior in a specific situation is a function of both individual mental and biological dispositions and the situational characteristics; it is a matter of mutual causation. A person with a strong latent disposition for alcohol will not become an alcoholic if the proximal environment does not offer access to alcohol. Similarly, it is only under specific environmental conditions that an aggressive person commits violent crimes. This is one reason why prediction of individual behavior in new situations is often not possible.

Biological Factors in the Person-Environment Interaction Processes

The incorporation of biological factors into the model for the functioning and development of an individual provides one of the basic new propositions in a modern/holistic-interactionistic model. For the following discussion it is necessary to clarify the distinction between "biological" and "inherited" aspects of individual functioning and development. When a specific behavior is empirically found to be related to some biological component of individuals, it tends to be misinterpreted as genetically determined. Biological functioning at a certain stage of development is more than the effect of genes. A developmental analysis is required to determine how a person's constitutional, biochemical, genetic, and experiential factors are interwoven.

In 1883, when Wundt advocated psychology as an independent scientific discipline, he emphasized the biological basis of psychological phenomena (Wundt, 1948). William James (1890), in *Principles of Psychology* devoted two chapters to a discussion of the brain and brain activity before dealing with his main topic, the mind. And in 1899, Angell and Thompson discussed the relation between organic processes and consciousness. Later,

in his presentation of functional psychology, Angell (1907) stressed the need for the integration of biological factors in the model of individual functioning. During the last decades of the twentieth century, Eysenck (1990) was an influential advocate of the biological bases for personality factors. Previously, Lehrman (1970), Schneirla (1957), and Tobach and Schneirla (1968) all discussed the role of biological factors in developmental processes. As emphasized by Lerner (1983), the interaction process between an individual and the environment can be described as an active adaptation process. In this adaptation process, biological factors, in constant interaction with mental components and behavior, play a central role. For example, Selye (1976) discussed the adaptive role of the adrenal cortex, which produces corticosteroids such as cortisol through release of ACTH from the anterior pituitary gland in response to stress. The relation of thoughts, emotions, feelings, and behavior to biological processes has been elucidated in recent empirical research (e.g., Damasio, 1999; LeDoux, 1996). Experiments on captive monkeys by McGuire and his coworkers showed how social factors, such as the status of the leader in the group and his interpretation of the behavior of other group members, affect his level of serotonin and 5-HIAA, which are important regulators of individual mood (Raleigh, McGuire, Brammer, & Yuwiler, 1984). In research on free-ranging baboons, Sapolsky (1990) demonstrated how strongly social and biological factors interact and how the feedback mechanisms of the cortisol system can be blocked in low-status animals (see also Sapolsky, 2005). The role of biological factors in adolescence was discussed by Petersen and Taylor (1980). Further reasons for considering biological factors in research on personality development were summarized by Susman (1998). How concepts from biological theory have been assigned a role in the continuity of social behavior was critically assessed by Cairns and Hood (1983) and discussed by Earls and Carlson (1995).

Contributions from developmental psychobiology have substantially increased our understanding of the role of biological factors in individual development processes (e.g., Kagan, 2003; Segalowitz & Schmidt, 2003). In the interaction processes, biological components of individual functioning are also influenced by environmental factors. For example, the contextual role in developmental processes is already evident in the prenatal period (e.g., Huizink, Mulder, & Buitelaar, 2004). And M. K. McClintock (1971), studying the influence of social factors on biological functioning, found that in the course of a study year, the menstrual cycle in female students who shared dormitory rooms had been synchronized; in many cases, they coincided totally before the end of the school year. Discussing the role of practice in forming individual behavior, Ericsson, Krampe, and Tesch-Römer (1993) argued that practice diminishes the role of biological factors, which are usually regarded as fixed.

Biology and Antisocial Behavior

Antisocial behavior is an aspect of individual functioning for which a systematic and often replicated relation to physiological activity/reactivity has been demonstrated. Research on neurotransmitters, hormones (e.g., testosterone, cortisol, and adrenalin) and pulse rate as components in adolescent development was summarized by Ortiz and Raine (2004) and Raine (2002). In these studies a positive, sometimes strong correlation has been found between antisocial behavior and low physiological activity/reactivity as reflected in low adrenaline excretion. In our longitudinal study IDA for boys at the age of 12 and 13, significant, negative correlation was found between data for aggressiveness and data for hyperactivity, on the one hand, and data for adrenaline excretion in the urine sampled in two different situations at school, on the other. Later, when criminal records were obtained for these males through the age of 30, a strong, significant relation was found between data for persistent criminal activity and data for relatively low adrenaline production in the situations at school (Magnusson, af Klinteberg, & Stattin, 1993).

It is noteworthy that persistent offenders as a group have been found to have more transmitter substance dysfunctions than do control groups of nonoffenders (Alm et al., 1994; Belfrage, Lidberg, & Oreland, 1992; Moffitt et al., 1997; Raine, 1997). In an earlier section, research showed the role of the brain, particularly the amygdala, in eliciting physiological activities as a basis for adequate mental and behavioral responses to fear and threat. It has been suggested that malfunctioning of the amygdala could be involved in inadequate violent behavior in such situations (e.g., Magnusson, 1996a).

Biology and Well-Being

Empirical research on the role of biological factors in individual development has been focused on antisocial behavior. Recently, empirical research has demonstrated the existence of a complementary biological system, connected with well-being, calm and positive

social interactions—the calm-connection system (Uvnäs-Moberg, 1998a, 1998b; Uvnäs-Moberg, Arn, & Magnusson, 2005). The corresponding physiological pattern consists of muscle relaxation and lowered levels of cortisol and cardiovascular activity as well as enhanced activity in the gastro-intestinal tract promoting digestion and anabolism. The vagal, parasympathetic nervous system is activated and the hypothalamo-pituitary axis and the sympatho-adreno-medullary system are shut down. At the central level, hypothalamus oxytocin plays an important integrative role.

From the holistic-interactionistic perspective, the introduction of the calm-connection system fills a vacant space in the model of the integrated psychobiological system. It complements and balances the fight-flight system—introduced by Cannon (1914) and further developed by Selye (1976)—which has played a central role in research on stress and antisocial behavior. As an integrated part of the functioning of the total organism, the concept of the calm-connection system enriches the theoretical basis for empirical research in the recently developed "positive development" area (see Aspinwall & Staudinger, 2003). As argued by Magnusson and Mahoney (2003), successful research in that area requires a holistic-interactionistic frame of reference to enable the formulation of the necessary synthesis of knowledge.

The brain plays a central role in the integration and coordination of the fight-flight and stress system, on the one hand, and the calm-connection system, on the other. During infancy, the brain is particularly open to and dependent on stimulation from the social and physical environment. Under optimal conditions, the brain develops so that adequate positive and negative emotions are attached to the information offered by the environments as well as to conscious and subconscious mental activities and behavior.

Comments

The brief overview of the role of biological components shows the importance of considering such components in theorizing and empirical research in integrated developmental processes. Two characteristics of the biological tradition in psychological research are noteworthy. First, for example, despite Angell's (1907) incorporation of biological factors into what might be seen primarily as a holistic view of individual functioning, biological factors have not been consistently integrated into psychological models. Rather, they have mostly formed an independent line of research with little impact on developmental research. Second, to the extent that biological factors have been studied empirically, their role in individual functioning has most often been seen as causal; a reductionistic view has dominated. Exceptions can be found in the work of Bronfenbrenner and Crouter (1983), Cairns (1979), and Lerner (1984) and in the presentations by psycho-biologists such as Kalverboer and Hopkins (1983) and Levine (1982). Dawson, Ashman, and Carver (2000) summarized research on the role of upbringing conditions and the long-term effects in brain development, and Glaser (2000) reviewed research on the role of child abuse and neglect for brain development. Also, an overview of research on biology in individual development was presented by Gottlieb, Wahlsten, and Lickliter (1998).

The Nature-Nurture Issue: Hereditary and Environmental Factors in Individual Development

The relative role of hereditary and environmental factors, both in current functioning and in individual development, has been a topic of debate since ancient times (e.g., Garcia Coll, Bearer, & Lerner, 2004; Gottlieb, Wahlsten, & Lickliter, Chapter 5, this *Handbook,* this volume). This issue is relevant to the focus of this chapter. Ongoing debate has been dominated by references to estimates of the relative magnitudes of group-level variance attributable to genetic versus environmental factors. The limits of this approach were underlined already by Anastasi (1958) and a number of followers (e.g., Cairns, 1979; Dodge, 1990; Medawar, 1984).

An important step toward understanding the role of genes in developmental processes was the discovery of DNA and the genetic code in the 1960s. This discovery opened new windows for mapping the individual genome structure and for research on the mechanisms by which genetic factors operate. The interpretation of recent research along this line has led to the introduction of theoretical models that emphasize the composite function of genetic and environmental factors in the developmental processes of individuals.

The present state of the nature-nurture debate was recently summarized by Lickliter and Honeycutt (2003a, 2003b):

> As a result, a number of psychologists continue to take for granted that behavior is somehow determined by more fundamental or primary processes that occur at the ge-

> netic level. This unidirectional, bottom-up view of the causes of behavior overlooks much of the conceptual and empirical content of contemporary biology, which shows that genetic factors are always part and parcel of the individual organism's developmental system. No single element or level in the system necessarily has causal primacy or privilege, and the functional significance of genes or any other influence on behavior development can be understood only in relation to the developmental system of which they are a part. (Lickliter & Honeycutt, 2003a, p. 830; see also, Gottlieb, 2000; Rutter, 2004)

The onset and course of certain developmental sequences may be determined genetically to the extent that they are common to all individuals. However, even such developmental sequences as the onset of the menstrual cycle and the regulation of growth in height are to some extent modifiable by environmental factors (Tanner, 1981). That there is a hereditary predisposition for a certain type of behavior does not mean that it cannot be changed by environmental intervention (Angoff, 1988). The individual phenotype develops within the framework offered by the genotype along with the environment, a process that starts at conception and goes on throughout the life span. On the stage set by inherited factors, many different dramas are possible (Waddington, 1962).

Accordingly, in most respects, individual development takes place in a process of maturation and experience in interaction with the environment, on the basis of and within the limits set by inherited factors. Kagan (1992), who argued for a hereditary component in temperament, emphasized how the environment modifies this influence. Cairns (1996), in a 20-year evaluation of the roles of heredity and environment in individual differences in aggression, concluded that the differences in mice obtained by selective breeding over 30 generations show strong environmental specificity. The aggressive behaviors in descendant lines can be modified by environmental social conditions to such an extent that the inherited differences are eliminated. In well-planned longitudinal studies of newborns, Meyer-Probst, Röesler, and Teichmann (1983) demonstrated that favorable social conditions acted as protective factors for later social development among children identified at birth as biologically at risk. With reference to the results of a training program for animals and humans, Schrott (1997) concluded that:

> environmental stimulation has been found to increase brain weight (especially forebrain), cortical thickness, the number of glial cells, the glia to neuron ratio, neuronal cell body and nucleus size, and to alter synaptic profiles by increasing dendritic branching, dendritic spine density and the number of discontinuous synapses. (p. 45)

A general model was previously discussed for the interplay of mental, biological, behavioral, and situational components involved in current functioning of an individual. In this model, the individual's interpretation of environmental events leads to activation of the sympathetic nervous system and excretion of stress hormones such as adrenaline and cortisol. Under normal conditions the process is an adaptive response, with no detrimental consequences for the individual. However, when persistent stress leads to overproduction of such hormones, they can override genetic regulation and may cause harm rather than protection (see Lundberg, 2005).

Biological Age: A Marker of Maturation Rate

As illustrated in the empirical study in IDA, described earlier, the rate of maturation is a powerful operating component influencing a girl's dealing with the environment and the environment's reaction to the girl. Effects of the rate of maturation have also been observed in studies of boys (Andersson, Bergman, & Magnusson, 1989).

Traditionally, individual development has been expressed in chronological age; that is to say that an individual's level of development is represented by the time the earth has circled around the sun since he or she was born. That is the one thing that all individuals with the same birthday have in common. It is a distressing fact that most studies on puberty and adolescence still neglect this observation even though alternative bases for the study of individual differences in developmental rate have been called for for decades (e.g., Baltes, 1979; Horn & Donaldson, 1976; Thomae, 1979; Wohlwill, 1973).

The existence of strong interindividual differences in growth rate may have profound consequences, not only for individual differences in various aspects of functioning, but also with respect to the way the environment reacts to the individual. Differences in developmental timing are thereby related to individuals' social relations, as well as to their capacity to meet environmental demands and to use environmental opportunities effectively. However, to control for biological age rather than chronological age when designing empirical studies is only a remedy under specified conditions. Biological and chronological factors are nested; the expression of

individual differences in growth rate for central factors in developmental processes is sometimes counteracted by societal influences, which are bound to chronological age: for example, compulsory school education, compulsory military service in some countries, and the compulsory age for retirement.

Personality Consistency: A Matter of Person-Environment Interaction

A core issue in discussions of PE relations is personality consistency. A series of empirical studies using a strict experimental design, both with children and with adults as participants in natural situations, investigated the cross-situational stability of manifest, current behavior using ratings based on systematic observations (Magnusson, Gerzén, & Nyman, 1968; Magnusson & Heffler, 1969). The studies yielded two important results. First, observations of individuals over situations with no variation in situational conditions showed a high cross-situational stability in ratings of manifest behavior. However, observations over situations when situational conditions were varied systematically with respect to members of the group and the group task revealed extremely low cross-situational stability of individual behavior. Second, in successive observations of the same participants in a number of situations, varied with respect to situational conditions, the agreement between independent raters of the participants' behavior increased successively to a reasonably high level. The conclusion was that a person's individuality is reflected in his or her unique way of handling situational conditions, reflected in partly unique patterns of manifest behavior across situations (Magnusson, 1980).

These results, obtained under strict experimental conditions, have fundamental methodological implications both for the study of the stability of personality characteristics and for the study of stability and consistency of developmental processes. In both cases, the choice between situation-bound state data and latent trait data will have decisive consequences for the outcome of an empirical study. Interpretations of observations of individuals in specific situations must always consider situational conditions under which the data were obtained and refer to; for example, when data refer to a laboratory study, to a natural experiment, or to systematized observations without an experimental design. The choice between state and trait data also has basic consequences for empirical studies of developmental issues. For example, measurements of the developmental stability of a certain behavior will, among other things, depend on the degree of similarity with respect to the situational conditions under which the original base data and the follow-up data were collected.

A study of relevance for the discussion of stability and continuity in developmental processes was recently reported by Li et al. (2004). Using a sample of participants with an age of 8 to 89 years, they tested the differentiation-dedifferentiation hypothesis about structures of intelligence across the life span and drew the following conclusion: "These results indicate more compressed functional organization of intellectual abilities and cognitive processes in childhood and old age than in adulthood. In particular, these findings support the dynamic differentiation-dedifferentiation view of intellectual development across the life span" (pp. 161–162). This study is an important complement to earlier studies showing changes in cortical organization during childhood (e.g., Johnson, 2001) and aging. Among other things, these studies lead to two interrelated conclusions of basic importance in designing empirical studies on developmental processes. First, the content of a specific hypothetical construct or a biological component used in cognitive models changes its character and role in the dynamic processes of brain functioning across ages. Second, its significance in actual functioning of the individual is not linear across time.

In development, both individuals and their environments change as integrated totalities. The individual changes as a result of biological maturation and cognitive-emotional experiences gained in the interaction with the environment and the individual's environment changes as a consequence of societal changes at different levels, and of the individual's direct and indirect actions in and on it (e.g., choosing a new job or moving to a new environment). The simultaneous changes of the person and his or her environment also alter the nature of the interaction processes. In the long run, such a change may be radical, partly as a result of the interaction process itself (e.g., Lerner, 1991). For example, the nature of the interactive process in a family changes across time. The interaction between a child and its family is not the same as that child's interaction with his or her family in puberty, middle age, or retirement. The interaction process thus precipitates development (see the discussion of transformation as a basic principle in development).

The formulations of modern models for complex, dynamic processes have enriched research on developmental processes. However, the total organismic system and its subsystems of psychobiological and behavioral factors have properties that imply that they are less chaotic than the processes studied in meteorology in which chaos theory was first developed; the individual is intentional and an active part in the ongoing person-environment interaction process. Each psychobiological system functions and develops in a process in which two forces balance each other: On the one hand, maturation and experiences work for change, and, on the other, the principle of resistance to change. In the face of environmental challenges, physiological systems maintain a dynamic balance. Referring to stability through change in such systems, the concept of homeostasis has been replaced by that of "allostasis" (McEwen, 1998). Each biological system defends itself against inappropriate causes of change, which might lead to malfunction or destruction of the system. For example, in the normal functioning and development of the brain, a number of events, which might have led to a detrimental butterfly effect, are ignored, and only those that contribute to effective current functioning and to the development of functional new structures are accepted. Buffering mechanisms of this kind serve a fundamental role in the survival of all living organisms, including the human being (Hartman, Garvik, and Hartwell, 2001; Magnusson, 2003).

The importance of social factors for cognitive developmental processes was discussed and emphasized by Baltes and Staudinger (1996a). The Baltes and Staudinger (1996b) volume presents a broad overview of the role of different social factors in various aspects of developmental processes, extending the analyses to include an evolutionary and a cross-cultural perspective. The extent to which individual development is affected by environmental factors in the processes varies for different elements. On the one hand, in sexual development there are some features, such as gonadal structures and functioning, that are strongly regulated by biological factors. On the other hand, other aspects of individual functioning, such as choice of peers and type of sexual relations, may be wide open to experiential influences (Cairns & Cairns, 1994) and to societal normative factors for the appropriate age for initiating opposite-sex relations (Maccoby, 1990). One factor that influences the extent to which the socialization process of an individual, from infancy through childhood and adolescence, shows high stability is the degree of ecological constancy in the upbringing environment (Magnusson & Endler, 1977).

In summary, each change in the process of human ontogeny is understandable in the light of the individual's previous life history and the environmental influences operating at the time of the change. At each phase in the life course of an individual, the present state is the child of the past and the parent of the future. This tenet holds even for changes that are so abrupt that they seem to break a stable direction of development. For example, changes that have been characterized as "turning points," sometimes appear as a result of "chance events" or "significant events." In this perspective, the question of whether individual development is characterized by continuity or discontinuity is a matter of developmental processes, not of specific aspects in individual functioning, which is the focus that has dominated the debate (see e.g., Horowitz, 1989). Interesting aspects of this issue include the significant events that cause abrupt changes in processes, the conditions under which they appear, their possible long-term effects on the life course, and the relation of these aspects to age levels, and gender differences.

Continuity as a characteristic of individual functioning and development, underlying both change and stability, has been discussed for centuries:

> What remains is the formidable task of disentangling causal status among the variables in the developmental sequence, including the transactions that turn genetic chemistry into behavioral individuality and the ways in which social context and social relationships are implicated in both stability and change. (Hartup & van Lieshout, 1995, p. 681)

Continuity in individual development processes does not imply that changes are necessarily predictable. This circumstance does not preclude a scientific analysis of the process, as demonstrated in the research stimulated by chaos theory. Let us only refer to Scriven (1959), who in his discussion about prediction and explanation in evolutionary theory countered the view that high predictability of single events is a prerequisite for real scientific explanation: "Satisfactory explanation of the past is possible even when prediction of the future is impossible" (p. 477).

Individuality: The Developing Person

Basic properties of the organism at any stage of the life process are the result of a coherent process that starts at

conception and extends from the prenatal period onward. Patterns of psychobiological components are established during fetal and infant life (e.g., Nelson, 1999a; Stern, 2001). The early organization of individual capabilities—particularly the organization of the brain as the central organ for interpretation and appraisal of external information, for attaching emotions and values to this information, and for activating biological autonomic, endocrine, and muscular systems—forms the platform for developmental processes and has consequences for the life course of the individual. During the establishment of the mediating system in early infancy, the brain is particularly open for and dependent on organized, patterned stimulation from the proximal environment.

The functioning of the organism displays an inherent plasticity that makes it possible to overcome early deficits stemming from the individual, the environment, or the individual-environment interactions (see, e.g., Garraghty, Churchill, & Banks, 1998). In a recent article, Li (2003) discussed a bio-cultural dynamic model of developmental plasticity. The presentation of indications that the brain is particularly open to change during the early adolescent period (Spear, 2000) is of critical interest in research on puberty and adolescence. The brain continues to produce new nerve cells in adulthood (e.g., Kempermann & Gage, 1999).

The concern of psychology, in theory and empirical research, is the individual. In a lecture at the Swedish Academy of Sciences in 2002, the Nobel laureate Ralph Greenspan emphatically underlined the individuality of living organisms. The same view was expressed by Mayr (1997):

> The most impressive aspect of the living world is its diversity. No two individuals in sexually reproducing populations are the same nor are any two populations, species, or higher taxa. Wherever one looks in nature, one finds uniqueness. (p. 124)

Greenspan ended his talk by emphasizing that the challenge now is to find appropriate ways of analyzing the specific nature of individual organismic processes. These statements are equally valid for the human being.

The hypothesis of personality crystallization may help to shed light on the issue of developmental individuality (Magnusson & Mahoney, 2003). According to the hypothesis, the developmental process of individuals whose systems organization differ at a certain point in time—as a result of different constitutional factors, maturation, and environmental experiences—will take partly different directions in the next step. Each step forms the basis for future developmental alternatives and more stable "types" will eventually emerge over time. If this view is correct, it should show up in clearer homogenization within categories of individuals and more clear differentiation between categories of individuals over time. Empirical support for this hypothesis was presented by Bergman and Magnusson (1997) in the longitudinal IDA program. They observed that each of a number of problem behaviors—aggressiveness, motor restlessness, concentration difficulties, low school motivation, and poor peer relations—was equally frequent among the boys at the ages of 10 and 13. Between these ages, however, the distribution of problem behaviors had changed. The proportions of boys whose frequency of problem behaviors was high and low, respectively, both increased at the age of 13. Consequently, the proportion with mild indicators of problem behaviors had diminished.

Comments

The presentation and discussion in this section leads to two conclusions with fundamental implications for empirical research on individual, developmental processes. First, the target of analysis is the individual as an integrated element in a sociocultural environment with its specific norms, rules, attitudes, values, and valuations. Accordingly, these characteristics should be taken into account in the appropriate way when designing and interpreting studies on specific issues. Second, if the researcher wants to generalize about developmental processes across cultures, a careful theoretical and, in some cases, empirical, cultural, and cross-cultural analysis is required.

THE ENVIRONMENT IN THE PERSON-ENVIRONMENT SYSTEM

An individual's way of thinking, feeling, acting, and reacting develops in a process of close interaction with the physical and sociocultural environment. It is therefore pertinent to enumerate certain basic environmental properties that are relevant to understanding the processes involved in individual development. The aim is not to give a comprehensive presentation of research on environmental factors in the functioning and develop-

ment of the integrated PE system. It is rather to draw attention to environmental aspects that should be considered when designing, implementing, and interpreting empirical studies on specific developmental problems. For a fuller conceptual treatment of the role of environmental factors in developmental processes, the reader is referred to Bronfenbrenner and Morris (1998) and Schweder et al. (1998).

The Concept of Context

A key concept in models for individual current functioning and development is that of context. The total, integrated, and organized PE system, of which the individual forms a part, consists of a hierarchical system of elements, from the cellular level of the individual to the macrolevel of environments (Hinde, 1996; Lerner, 1978; Riegel, 1975). In actual operation, the role and functioning of each element depends on its context of other, simultaneously working components, horizontally and vertically. The development and functioning of a cell depends on the functioning and development of surrounding cells with which it communicates; that is, it depends on an influx of information from surrounding cells (Damasio & Damasio, 1996; Edelman, 1987). The development and functioning of the cardiovascular system is dependent on how other bodily systems, for example, the immune system, develop and function. An individual's socialization process depends on the functioning and development of other individuals with which he or she associates. The way an element of a certain culture functions, such as the proximal environment of the individual, is dependent on how other, related elements function.

The total PE system is hierarchically organized with respect to structures as well as to accompanying processes (Koestler, 1978, used the concept "holarcy" to denote this characteristic feature of a system). Each level of the system is simultaneously a totality in relation to lower levels and a subsystem in relation to higher levels. Systems at different levels are mutually interdependent. The functioning and development of the proximal sociocultural system, of which the individual is a part, depends on the characteristic features of the society and culture (e.g., Bateson, 1996; Hinde, 1996). In sociology, Coleman (1990) presented a comprehensive theory of the functioning of the individual and the environment and the interactive characters of this process. This section is restricted to identifying and discussing some aspects of the external environment with which the individual must deal and interact.

The Environment in Developmental Research

At the theoretical level, researchers in the area of personality have long emphasized that individual behavior cannot be understood and explained in isolation from the situational conditions under which it occurs. The importance of the situational conditions for behavior was observed by Reinhardt (1937): "reliability of predictions as to future behavior . . . depends not upon the constancy of individual purpose alone . . . but also upon the continuance or occurrence of the same type of situation" (p. 492). The view was strongly emphasized by Brunswik (1952), when he suggested that psychology be defined as the science of organism-environment relationships. Historically, the role of sociocultural factors in the developmental process of an individual had already been discussed in 1777 by Tetens. A strong proponent of considering environmental factors in individual development was W. Stern (1927, 1935), who emphasized the role of the environment as a "proximal space." Similarly, the concept of "proximal development" was central in Vygotsky's (1978) theory of cognitive and language development. Barker's (1965) analyses of settings, as well as Bronfenbrenner's (1989) analyses of levels of environmental factors, yielded new and substantial content to the topic. In his discussion of individual development in a life-span perspective, Baltes (1976) emphasized the role of environmental factors referring to what he designated dualistic-dialectic paradigms (e.g., Riegel, 1976).

The fact that psychology has not developed a language of environments to the same extent that it has acquired a language of behavior and personality is particularly indicative when one considers the role that environmental theories have played in neighboring disciplines that are also concerned with the functioning and development of organisms at the individual level. For ethnologists, it has always been natural to refer to environmental factors (e.g., perceived territories) in explanatory models of animal behavior (see Schweder et al., 1998). From their various perspectives, anthropologists and sociologists have also made essential contributions—often overlooked and neglected in the theoretical debate in psychology—to the discussion about the role of factors for human behavior. In the 1920s, the sociologist William I. Thomas (1927, 1928) discussed many of the issues that

are in focus today. He noted the distinction between actual and perceived environments and situations and discussed the problems connected with defining and demarcating a situation; he also stressed the developmental role of the situations an individual encounters and argued that environmental conditions must be incorporated into models of actual behavior.

Conceptual and Empirical Analyses of Environments

A scientific analysis of person-environment interaction processes presupposes a systematized descriptive analysis of the environment at different levels (Schneirla, 1957; Sells, 1963). A first attempt at an analysis of situations and situational conditions was presented by Rotter (1955), who discussed what he termed "the psychological situation"; that is, the situation as it is interpreted and assigned meaning by the individual. In a related theme, the role of the situation as the temporary frame for individual behavior was the focus of the discussion in a volume edited by Magnusson (1981). In his discussion of environment and behavior Pervin (1978) included an analysis of stimuli, situations, and settings. An overview of theory and empirical research on situations was presented by Forgas and Van Heck (1992).

Actual and Perceived Environments

An old distinction is that of the environment "as it is" and the environment "as it is perceived," construed, and represented in the minds of individuals. Here the two aspects are discussed as actual versus perceived environments. Knowledge about the organization and function of the environment in both these perspectives is needed for a proper analysis of person-environment interaction processes. It is assumed that the main function of the environment in these processes is the environment as it is perceived and interpreted by the individual. However, individual perceptions and interpretations of the external world are formed and function with reference to the organization and function of environment "as it is," the actual sociocultural and physical environment.

The Actual Social-Cultural Environment

Current individual functioning and individual development are dependent on the sociocultural environment at all levels of generalization, from rules and customs at the level of cultures to the habits, norms, and rules that are specific to the proximal environment.

For a long time, child research treated the social environment in rather gross, general terms. During the final decades of the twentieth century, however, research was extended to more specific aspects of the environment, for example, infant-mother attachment (e.g., Ainsworth, 1983), the particular situation for each child in the family setting (Dunn & Plomin, 1990), the family as environment (Maccoby & Jacklin, 1983), and the environment in child rearing interactions (Radke-Yarrow & Kuczynski, 1983).

The character of the social environment is of central concern in clinical work. In this connection, there has been criticism of the context-free type of classifications of mental disorders that are common in psychiatric practice. Emde (1994), reviewing discussions about diagnostic classifications in early childhood stated that: "current diagnostic classification schemes for this age group were inadequate because of limited coverage and because such schemes did not pay sufficient attention to individuals in context" (p. 72).

The Actual Physical Environment

The importance of the amount and diversity of physical environmental stimulation has been discussed theoretically and demonstrated empirically. White (1959) emphasized the role of the child's interaction with the inanimate environment in his discussion of competence as an important factor in motivation. J. McV. Hunt (1961, 1966) underscored the importance of the physical patterning of stimulation when he discussed the development of intelligence and intrinsic motivation. In his analysis of cognitive development, Piaget (1964) stated: "Experience of objects, of physical reality is obviously a basic factor in the development of cognitive structures" (p. 178). The research by Hubel and Wiesel (1970) demonstrated the crucial role of patterned stimulation for the proper development of the perceptual system. The arrangement of the physical environment, as well as the variety of stimulation and information it offers, has implications for the development of sensory perception, as well as for cognitive development.

The Environment as a Source of Information and a Source of Stimulation

The impact of external factors comes primarily through individuals' processing of information offered

by the environment. The perceptual-cognitive-emotional process of selecting and interpreting relevant information from the environment is largely affected by prior learning and experiences of similar past events, as underscored in adaptation-level models (e.g., Schneirla's, 1957, discussion of "trace effects"). Prior exposure has generated cognitive schemata, attitudes, and more or less habitual ways of handling, coping with, and securing control of the environment (Thompson, 1981).

Experiences are interpreted in the current frame of reference. Helson's (1964) "adaptation level" theory couches this process as an influence from earlier, repeated experiences of stimuli of a similar kind, present background factors, and residual memories of cognitions, emotions, and actions associated with previously experienced situations that are now recurring. Or, in the words of the Nobel laureate Aron Klug: "One doesn't see with one's eyes, one sees with the whole fruit of one's previous experience" (Fensham & Marton, 1991). Krupat (1974) also subscribed to similar notions about human functioning when he stated that: "prior experiences with danger (as well as confidence in one's own ability) act to decrease the subject's sense of vulnerability" (p. 736). Repeated exposure to the same type of environmental event has a variety of effects. It might, for example, lead to a decreased strength of reactivity (Magnusson & Törestad, 1992), to a more positive attitude with "mere exposure effect" (Moreland & Zajonc, 1982), or to substituting the original quality of reaction with its opposite "opponent process" (Landy, 1978; Solomon & Corbit, 1974). Accordingly, individual differences in preceding person-environment interactions and the functioning of the individuals' mental systems, lead to individual differences in the interpretation of the stimuli and events of a current situation. Such individual differences account for the partly unique way in which individuals cope with situational conditions.

The concept of the environment as a source of stimulation is best illustrated in experimental psychology. An essential tenet of the experimental tradition is that the stimulus is defined in objective terms. This assumes that the impact of a certain contextual factor is general and has the same meaning and the same stimulus value to all individuals (e.g., Fechner's reasoning about the objective character of physical stimuli).

Learning theories, which are of interest for our discussion, emphasize the role of the environment as a source of information. For example, in Bolles' (1972) specification of laws of learning, the environment as a basis for learning how to handle the external world effectively provides two types of information; two contingencies in the surrounding world are learned. First, children learn to see linkages between certain external conditions and their outcomes (situation-outcome contingencies). Second, they learn that certain actions they take will lead to predictable outcomes (behavior-outcome contingencies). These learned contingencies render the environment both predictable and malleable. Seligman's (1975) theory of learned helplessness implies that the link between individuals' actions and the information they receive about the impact of these actions on the environment has been distorted, with detrimental consequences for individuals' mental life. If the learned helplessness state is generalized and persistent, individuals consider the environment impervious to their influence.

Optimal Environments

Related to the discussion of the environment as a source of stimulation is the issue of optimal stimulation, which involves two topics: preference (the preferred level of stimulation) and enhancement (the developmentally optimal level of stimulation; Wachs, 1977).

Much of the research on the role of environmental stimulation seems to assume a monotonic relation between the amount of diversity in external stimulation and optimal development (Wohlwill, 1973). However, there is enough empirical evidence to suggest that there is an optimal level of stimulation with respect to both preference and enhancement. Both too little or too much stimulation results in less satisfaction and less adequate development than occurs with intermediate stimulation (see Schneirla's, 1959, theory of biphasic approach-withdrawal processes). Empirical research on stress, for example, shows that either too high or too low demands on activity lead to physiological and psychological stress reactions.

What constitutes optimal environmental conditions varies between individuals, across age for a given individual, and between the sexes (e.g., Csikszentmihalyi, 1993). The optimal level of stimulation also varies with each individual's adaptation level, based on earlier experiences, learning, and maturation. This can be particularly critical at certain ages such as when the organism is prepared for and responsive to stimulation that will not have the same effect at other stages of development

(e.g., the concept of readiness). Hubel and Wiesel (1970) demonstrated the crucial role of optimal stimulation in a critical phase of development, studying the first period of life for the development of the ocular system in kittens.

The human organism has an inbuilt drive to order and organize external information. Two characteristic features of the environment facilitate this: consistent patterning and influenceability. The first requirement is that the environment is physically and socially organized in a consistent way. Such conditions facilitate the individual's striving to assign meaning to his or her proximal environment and make valid predictions about the external world as a basis for its own actions. The patterning and regularity of external information is particularly important during early infancy when the brain develops and is organized so that it links appropriate emotional reactions to what the child sees and does (e.g., Lagercrantz, Aperia, Ritzen, & Rydelius, 1997). Radke-Yarrow and Kuczynski (1983) addressed the role of caregivers in structuring the child's social environment to facilitate the socialization processes.

The second criterion for optimal environments is that they can be influenced by the individual's action and that this can be done in a predictable way; the individual must be able to exert active control of his or her environment. This criterion is a prerequisite for developing self-identity, self-efficacy, cognitive and social competence, and feelings of control.

Formative and Eliciting Events

Related to the distinction between models for current individual functioning and models for individual development is the difference between "formative" (developmental) and "triggering" (current) events (e.g., Spring & Coons, 1982). Formative life events influence the predisposition for a certain behavior, including antisocial behavior and the vulnerability to disorders. Thus, they affect development by increasing or decreasing the probability for later behaviors and disorders (e.g., Brown, Harris, & Peto, 1973). Triggering events may elicit a certain behavior or a schizophrenic episode without necessarily increasing or decreasing the probability for later behaviors and episodes.

Where triggering events are interchangeable because their effects are typically channeled through nonspecific routes, like stress in the case of physical and mental disorders, formative events may be more specific and noninterchangeable. From an interactionistic view, formative events would be active in development by shaping individuals' readiness to cope with particular situations. Triggering events occur only in the contemporary perspective; for example, access to alcohol on a specific occasion may release an act of alcohol abuse, while lack of alcohol may prevent alcohol abuse even in a person with a disposition for it.

Significant Events

There are individual differences in both the magnitude and type of environmental influences on the developmental process. Of particular interest is the occurrence of single events that have a profound impact on the life course of an individual. Although some of these events appear to occur randomly, their role in an individual's developmental process is dependent on the individual's readiness for a certain type of action or reaction, such as marriage or a new job, together with an opportunity offered by the environment (e.g., Bandura's, 1982, discussion of "chance events"). In other cases, a significant event may be the result of deliberate action by the individual himself/herself or by individuals whose actions influence others. Sometimes the effect is not visible immediately, but grows slowly and eventually has decisive effects on the individual's life in a manner that is typical of the so-called butterfly effect in chaos theory. Originally, attention was drawn to this characteristic of dynamic systems by Poincaré (1946):

> A very small cause, which escapes us, determines a considerable effect we cannot help seeing, and then we say that the effect is due to chance. . . . If we could know exactly the laws of nature and the situation of the universe at the initial instant, we should be able to predict the situation of this same universe at a subsequent instant. . . . But it is not always the case; it may happen that slight differences in the initial conditions produce very great differences in the final phenomena; a slight error in the former would make an enormous error in the latter. Prediction becomes impossible, and we have the fortuitous phenomenon.

Many of the processes that exert decisive effects on the life course of individuals have this characteristic. For example, buying a new house in a given area with specific features in neighbors, job opportunities, schools, and cultural and leisure-time activities, may have decisive effects on the future life course of all family members, not least of all the children. In other

cases, the effect is more direct and leads to what has been discussed as "turning points" (Pickles & Rutter, 1991). Often, the necessary condition for a significant event to have this dramatic effect is that the individual is in a state of disequilibrium at the time of its occurrence, and the event serves to restore the balance of the total system and give new direction to the life course (Magnusson, 1988, p. 33). Under such conditions, significant events in individual life cycles serve the same function as "bifurcations," addressed by catastrophe theory, in the physical environment.

Proximal Dynamic Person-Environment Systems

For current functioning as well as for developmental processes, the most significant environmental role is played by the part of the environment that an individual confronts directly. Discussing of environmental factors, W. Stern (1935) labeled this proximal environment personaler Nahraum" (Kreppner, 1992a, 1992b). Of particular importance for current functioning and development is the other individuals with whom the child interacts directly (e.g., Patterson & Moore, 1978). Peterson (1979) analyzed the role of person-to-person interaction and McClintock (1983) discussed how interactionistic analyses of social relationships contribute to theoretical and empirical progress.

Scholars are paying increased attention to the interpretation, understanding, and explanation of development as interactions between the socializing environment and the individual. At the same time, there is growing concern with the role of the distal sociocultural environment, which forms the framework for the families and peer groups. Certain models emphasize the commonality among behaviors in diverse contexts (Jessor & Jessor, 1977). Others are more apt to consider the match between environmental impacts and opportunities and the person's needs and characteristics (e.g., D. E. Hunt, 1975; Lerner & Lerner, 1987). Then there are those that entail a systematic study of the patterning of individual functioning in different contexts (Magnusson, 1988), while others are more process oriented, examining the interplay between the socializing agents and the individual person (e.g., Bell, 1968).

In this perspective, two social systems in which a child functions and develops are of particular importance: the family and peer network. Each system is complex and dynamic, and family and peer relations characteristically are involved in reciprocal, functional interaction.

The Family as the Environment in the Socialization Process

It is primarily in the frame of the home environment that we seek to understand a child's development. In a comprehensive study in the IDA program of children rejected by their peers at school, interviews with the parents revealed a systematic relation between these children and family characteristics in three respects: home atmosphere, parents' experience of their roles as workers and up-bringers, and relations between parents (Magnusson, Dunér, & Zetterblom, 1975). Socialization research has traditionally focused on the general structure of the home environment, cohesion, parental guidance and rule setting, the ways parents set up a predictive environment for the child, regulations concerning autonomy and responsibility in the family, parental encouragement and support, the parents as role models, family routines and communication, the involvement of children in family decisions, planning and organization, and so on. The issue of decisional autonomy in well-functioning families is seen as a developmental task for adolescents. In this process, Baumrind's (1989) differentiation between authoritative and authoritarian disciplinary styles and counterpoise of parental control and emotional support has gained widespread recognition. So has Olson's differentiation between cohesion and adaptability in families (Olson et al., 1983).

Reciprocity in Relations and Levels of Analysis

The family offers the best illustrations of the inseparability of a person and his or her context. The realization that parent-child relations are a bidirectional process, to be examined from an interactive viewpoint, is perhaps the single most outstanding feature of present-day research on family processes (e.g., Bell, 1968, 1971; Kerr & Stattin, 2003). Each member is an active, integrated part of the family system and contributes to his or her social context. In her historical overview of the socialization of children, Maccoby (1992) underscored that in recent decades two major changes had occurred in family research. The first was a movement from parents as the cultural transmitters (the top-down view or a main effects model) to a more interactive view of parent-child processes. The second was a profound understanding of

and preoccupation with the complex mechanisms involved in parenting: moderating and mediating factors, multiple determination, and interaction processes. Recently, Maccoby (2003) again emphasized the bidirectional view on research:

> Nowadays, most students of family dynamics adopt a much more nuanced view of influence among family members. They see it as a set of reciprocal processes unfolding over time, with each family member adapting to the overall configurations of family roles and functions, as well as to each other family member individually. (p. 193)

As summarized and discussed by Kreppner and Lerner (1989), there is also a stronger emphasis on transgenerational issues, orientations toward both psychologization and sociologization of family processes, the start of a more deepened understanding of the role of factors for similarities and differences in socialization of individual children in families, and stronger realization of the close dependence of socialization on the particular historical time.

Both macro- and micro-oriented research is needed to obtain a fuller understanding of within-family processes. The exchange of behaviors and emotions between parents and children in specific situations analyzed at the micro level may not necessarily be reflected in analyses conducted at a more molar level. The study by Dowdney and Pickles (1991) on mother's and child's expression of negative affect in disciplinary situations illustrates this. The children were found to respond to the immediate behavior of their mothers in specific situations, whereas the mothers reacted to child behaviors maintained over episodes.

Besides examining relations between family members as dyads, triads, and tetrads (von Eye & Kreppner, 1989), there is a need to define the family system from the viewpoints both of all members of the family (Olson et al., 1983) and of the total family itself as an object of research. The view of the family as a self-organizing entity and a functional whole has been highlighted in family system models (Belsky, 1981; Hinde, 1992; Minuchin, 1985). However, although socialization research today has come far in understanding family processes, few attempts have been made to examine family life (attitudes and behaviors) simultaneously from multiple perspectives: those of the father, the mother, and the children.

Families and the Time Dimension

Issues of parenting, parental attitudes, rules, and disciplinary practices are substantial. But isolated from other characteristics of the family and from changes in constellations, structures, and interaction patterns occurring in the family, they tend to be handled as static entities, as stable characteristics of the parents or the family as a whole. Rather, parenting is characterized by both stability and change. Over the years, parents' behaviors and attitudes change with the developmental level of the child, and can vary between children in the same family. Neither do changes on the part of parents occur in isolation from what is going on in the rest of the family; the overall family process changes over time. For example, Stattin and Klackenberg (1992) examined the relationship between childhood and adolescence for specific patterns of discordant within-family relations (with mother-child, father-child, and mother-father discord as the constituent factor).

Family in Context

In addition to an increasing emphasis on bidirectionality and complexity, there is today a stronger articulation of the contextual embeddedness of socialization (Lerner, 1989; Oliveri & Reiss, 1987). The child's functioning and development in day care, school, and the peer group are linked to the family. One of many such studies is Steinberg's (1987) study on latchkey children and their peer orientation. Moreover, parenting occurs in and is a reflection of the family itself, its economic situation, the availability and quality of day care and school, neighborhood influences, other institutional organizations and social networks, and the wider social and cultural context. How parents react to their children in everyday life is linked with their other experiences. For example, Greenberger, O'Neil, and Nagel (1994) reported substantial associations, as well as complex interactions, between aspects of the parents' work conditions and their parenting.

Peers

An extensive body of literature indicates that peer relations constitute the interpersonal environment in which much new behavior emerges among children and adolescents. Peer relationships and friendships are particularly interesting for adolescents (e.g., Berndt, 1982; Cairns & Cairns, 1994). With respect to the role of peers in the developmental processes, three themes for

research on peer relations can be distinguished: (1) individual behavior associated with peer relations, (2) the characteristics and the functioning of the peer group for individual behavior, and (3) the contextual embeddedness of the peer group.

Individual Behavior Dependency of Peer Association

The first theme focuses on the individual and the peer group and is of interest only insofar as it yields information about the individual. During the 1970s and 1980s, hundreds of studies were conducted on individuals' peer status (i.e., popular versus unpopular; neglected, controversial, and rejected children) and associated characteristics such as peer interaction, coping and problem solving, social skills and competence, school adjustment and achievement, different aspects of personality, emotions, loneliness, and prosocial and agonistic behavior (e.g., Coie, Dodge, & Coppotelli, 1982; Coie & Kupersmidt, 1983). In a developmental perspective, data for social-skill problems and low peer status of children and adolescents were statistically related to data for adjustment problems later in life such as school dropout, delinquency, and mental health problems (e.g., Cowen, Pederson, Babigian, Izzo, & Trost, 1973; Kohlberg, LaCross, & Ricks, 1972). This line of research was to a large degree a psychometric and sociometric approach, and reflected in the main a unidirectional view of causality.

Characteristics and Functioning of the Peer Group

The object of interest in the second line of research is the functioning of the peer group and its psychosocial processes. Bronfenbrenner (1943) made an essential point that is in line with the general view of this chapter:

> Social development applies not only to the individual but to the social organization of which he is a part. Variations occur not only in the social status of a particular person within the group, but also in the structure of the group itself—that is, in the frequency, strength, pattern, and the basis of the inter-relationships which bind the group together and give it distinctive character. (p. 363)

In this tradition, the reciprocity in friendships has been examined (Gershman & Hayes, 1983), and similarities between the individual and his or her friends in sociodemographic variables, attitudes and behaviors have been investigated (D. B. Kandel, 1978).

In contrast to the traditional sociometric and psychometric approach, a process-oriented approach was adopted by Cairns and Cairns (1994) in their longitudinal research program, as well as implemented in the theoretical framework of this chapter. Based on data collected on an individual basis over the whole adolescent period for a large sample, almost without attrition, they were able to study in depth and in process terms the dynamics of peer relations and the role of these relations for the developmental processes of individuals during adolescence (Neckerman, 1992). A program with the same goal, of depicting "action in," was the Berlin Youth Longitudinal Study. Among other things, empirical studies in that program (see Silbereisen & Noack, 1988) revealed the dual quality of many adolescent behaviors in both compromising momentary or future psychosocial health and being tools in the pursuit of satisfying the individual's personal and social goals.

Seen in the life-course perspective, a central question is how peer characteristics come into the picture of changing behaviors. Studies from the IDA program, reported by Magnusson et al. (1985) and Stattin and Magnusson (1990), verified how social behaviors, in both a short- and long-term perspective, are systematically linked with characteristics of the peers with whom one associates in early adolescence. For further empirical research, the interesting observation is that it is relationship to peers outside the classroom that matters most, a finding that restricts the generalizability of findings obtained by studying relations to classmates. Studies from the same program have documented that association with nonconventional peers together with low educational motivation in adolescence, is an antecedent factor in the background to an adult homemaking orientation rather than a career orientation among females (Gustafson, Stattin, & Magnusson, 1992).

The wealth of studies on peer relations has been more informative about relationships between peer status and behavior, and the social and personal characterization of the individual relative to the group, than about how the peer climate reinforces individual behavior, what characterize the peer group and its stabilization, group processes, and how behavior develops in the peer group (Hartup, 1996). One line of research has contributed new information on how delinquency escalates in friendship groups. In videotaped experimental settings, Dishion and colleagues (Dishion, McCord, & Poulin, 1999) examined how rule-breaking talk develops when boys speak and respond to each other's comments; the authors

have labeled this "deviancy training," meaning there was contingent positive reactions to discussing rule-breaking topics (e.g., Kiesner, Kerr, & Stattin, 2004).

The Contextual Embeddedness of the Peer Group

Of particular interest for a discussion of peer relations and peer group functioning is the role of the sociocultural proximal and distal environments as the framework for the emergence, structure, and functioning of peer groups. The role of sociocultural factors is illustrated by the formation and functioning of peer groups with respect to the emergence of criminal youth gangs. Emler and McNamara (1996) argued that research on adolescence tends to underestimate the degree to which the amount of time spent with peers and the extensiveness and activities of the peer group are tied to the institutional participations of adolescents.

Distal Environments

Family and peers are not the only socializing influences on children and adolescents. Proximal environments are embedded in economic, social, and cultural systems of a higher order. The specific nature of these distal systems in a particular society determines the opportunities and restrictions for the functioning and development of proximal environments, such as the family and peer groups, as well as the opportunities and restrictions for the functioning and development of individuals. A great deal of research has been focused on the broader sociocultural influences, as represented in the community, the neighborhood, at school, and in leisure-time settings (e.g., Lerner, 1995). For example, whether or not pubertal maturation affects girls' social adjustment has been found to be dependent on the school setting (Caspi, 1995), neighborhood conditions (Ge, Broady, Conger, Simons, & Murry, 2002), and characteristics of the community (Dick, Rose, Viken, & Kaprio, 2000).

Social and Economic Conditions

The best-known example of how distal economic and social factors and changes in these respects affect individual behavior is the seminal work by Elder and coworkers using data from the longitudinal studies at the Institute of Human Development at Berkeley, California (see, e.g., Elder, 1998). A series of studies systematically mapped the impact on family cohesion, parenting, and child behavior of the economic crisis during the depression in the early 1930s. One of the findings is that the "economic pressure" of severe income loss mainly affected the husbands (Elder, Van Nguyen, & Caspi, 1985). The increased arbitrary discipline of fathers, elicited by income loss, then affected problem behavior of the boys. A longitudinal study of how hard times, economic crisis, and value changes in Albania have affected family relations and child behavior, was reported by Kloep (1995). The psychosocial timetable may be heavily influenced by the broader macro social conditions and institutions, as demonstrated by Silbereisen (1995) in a series of studies with respect to vocational choice, when he compared adolescents raised in the former East and West Germany.

Formal and Informal Societal Regulations

To a varying extent, opportunities and restrictions for the functioning and development of individuals and of proximal environments are determined by formal, societal rules. Some are bound to chronological age such as entering and ending compulsory education, joining the army, or age of retirement. Some are nationally regulated, while others may be locally determined. The extent to which legal norms exist varies across countries and societies. The socialization process is also dependent on and influenced by informal societal norms and rules such as the rules for dating in the traditional U.S. culture or for female dress in fundamentalist Muslim countries. Informal rules for individual behavior may be general and even hold across societies; others are more specific and bound to certain groups (e.g., religious sects) or temporary trends (the hippie movement of the 1960s and 1970s). To some extent they are normative, for example being based on chronological age, and to some extent they are more individual, and bound to, for example, intellectual competence or membership of a certain class. Even the societal regulations that are informal may create implicit, sometimes very strong elements of expectations in the individual's sociocultural setting. In that sense, they are forceful in regulating individual behavior, particularly during puberty and adolescence.

The Environment as a Changing Stage for Individual Functioning and Development

The environment provides a frame of reference for ongoing individual behavior, a stage on which a wide range of behaviors can be manifested. As such, changes that are influential in developmental processes take place in both the proximal and the distal environment (e.g., Sameroff,

Peck, & Eccles, 2004). Components in the individual that are involved in maturation and experiences in the course of individual development are nested with environmental factors that change over time.

The developmental timetable for the settings surrounding peer relations illustrates how person and environmental factors are engaged in an interactive process of change. In childhood, peer interaction occurs in the near neighborhood, in nursery school, and later at school. In adolescence, leisure time activities change from adult-led, organized activities in early adolescence (e.g., sport clubs), to more adult-like, commercial activities (pubs, clubs, and discos) in later adolescence (e.g., Hendry, Shucksmith, & Glendinning, 1995). The kind of proximal environments an individual encounters in this developmental process is dependent on the nature of distal social, economic, and cultural factors and the families and individual's choices of environments (as long as they have options) and actions.

In a long-term perspective, the distal environment undergoes change. The changes, such as those described above, lead to changes in the proximal environments of individuals (Elder, 1996). Compare, for example, conditions today with those only 50 years ago with respect to travel, communication, exchange of information, and industrial production. Ideological and political movements influence and alter educational opportunities and systems as well as societal norms, rules, roles, and values. Urbanization, almost throughout the world, has not only meant that more people grow up and live in urban areas but also that the economic, social and cultural character of urban areas has changed, sometimes drastically. One implication of these changes is that a person growing up and staying in the same local environment may die in a distal environment that differs greatly from the one in which he or she was born. Moreover, different generations are born in and live in different environments, with different norms, values, resources, and demands. It follows that valid generalizations are difficult to make across generations and across cultures about what are the dominant factors and the operating mechanisms in individual developmental processes.

Individual-Environment Synchronization

To maintain a developmental perspective, we need to understand both the formal and the informal societal influence on behaviors, norms, and roles in child and adolescent development (Ryff, 1987). The infrastructure of formal and informal regulations tends to form a social timetable of demands and opportunities for the individual; a timetable that is sometimes strongly age graded (Caspi, 1987). Despite the wealth of specific options, a country's broader institutional infrastructure and legal system are often similar for the majority, spelling out normative social roles and norms at different ages. This is not to say that children and adolescents have only one route to follow. On the contrary, one of the central problems in individual development lies in the synchronization of the individual's mental, biological and behavioral capacities with the demands, opportunities, and restrictions of the proximal and distal environments. The diversity of possible life paths may generate stress and insecurity among young people. What can be considered a favorable pathway toward adulthood in a society depends on the culture's "implicit theory of success" (Klaczynski, 1990; Ogbu, 1981). It also depends on local variations in the ecology. For example, a rural environment typically offers less educational and occupational opportunities, and adolescents' and their parents' educational aspirations tend to be lower than in more urban milieus (Sarigiani, Wilson, Petersen, & Vicary, 1990).

It can be argued that much of young people's thinking about the future (occupation, education, family and marriage, and material standards) and about themselves is linked with formal contextual and age-dependent changes (Nurmi, 1991, 2002). Rather than being strictly related to cognitive development or due to an unfolding of cumulative earlier experiences, thoughts about oneself (identity and self-concept) and one's future (plans, decisions concerning the future, wishes, and fantasies), and the restructuring of these self-views and worldviews are likely to depend on the chronological age for formal transitions, particularly in education. Entering the gymnasium or not in Sweden, just like entering college or not in the United States, has a major consequence for future work roles (e.g., Petersen, 1993). Accordingly, the unfolding structure of the educational system in a given society can provide much of the incentives for change in adolescence and for decisions that have effects on the adult roles of parent, spouse, and worker (e.g., Klaczynski, 1990). It has also been argued that what may be seen as a general trend (e.g., declines in educational motivation in early adolescence) and interpreted as a consequence of characteristics of the developmental period in question, may actually be a reflection of specific changes in the school environment in mid-adolescence, which are at odds with individual aspirations (Eccles et al., 1993). With a shared timetable for youngsters in a

given society, cross-cultural data are needed to discern the governing role of such social regulation in development (Thelen, 1981).

Genetic research has introduced the concept of "sensitive" periods when the organism is more open to learning experiences than at other times. Analogously, the age for changes in educational tracks, opportunities to engage in more mature forms of behaviors (such as public dances, movies), and other environmental changes may be seen as "critical" windows when contextual influences provoke a restructuring of one's life, both prospectively and contemporaneously.

One aspect of the synchronization process is the timing of the individual's decisions with respect to certain central aspects of social life. As mentioned, the choice of academic trajectory is of importance for the expected adult social life course. Finishing school early is associated with different timetables for future family planning, marriage, occupation, and attainment of material goods than finishing school late (Gustafson & Magnusson, 1991). The same is true of decisions to leave home early or late (Stattin & Magnusson, 1995). Gustafson, Stattin, and Magnusson (1989) showed that girls who started to date boys early tended to be oriented to homemaking rather than to a career in early adulthood. In summary, how children and adolescents use the available opportunities in the sociocultural environment, the age at which they make transitions, and how they define themselves in age-graded norms in society, can have profound consequences for their adjustment contemporaneously and for their future life track. To some extent, individual behavior is organized by the broader sociocultural arrangements as, through its institutions and age requirements on behavior, society shapes the direction of and sets the milestones for individual behavior. But individuals also organize their own development within the opportunities and restrictions offered by the environment, and by their own actions, young people select some types of developing environments at the expense of others, and through these means contribute to shape their unique development.

A Cross-Cultural Perspective

Cultural factors affect individual behavior through organizational-institutional arrangements in the proximal settings in everyday life. The question of how the cultural context influences individual behavior sets a central task for cultural and cross-cultural research. Such studies in recent decades have documented the existence of similarities and dissimilarities between cultural settings; however, one of the major problems in such research on child development is still to link variations in individual functioning in physical and social settings to the specific cultural elements in each cultural group (Harkness, 1992). Cross-cultural comparisons are not just a matter of comparing countries and speculating about differences that empirical studies have documented. They are about understanding similarities and differences in the different conditions within these countries. Cross-cultural comparisons are particularly needed to examine whether the setting mechanisms behind behavior are similar across cultures, whether the mediators of behavioral, family, and peer processes are similar or different, and whether the same factors operate as moderating conditions for psychological functioning in the same way across cultures.

In their study of changes in self-feelings during the transition toward adolescence, Brooks-Gunn and Paikoff (1992) emphasized the limitations of work on that issue when it comes to generalization across cultures. Stattin and Magnusson (1990) suggested that the specific short- and long-term consequences of the rate of sexual maturation, obtained for Swedish girls, might be different in cultures with other social norms, rules, and role expectations for teenage girls. More specifically, in a society that promotes contacts between teenagers of different ages, and particularly engaging in heterosexual relations, the connection between early pubertal maturation and problem behavior would be stronger than in a society based on chronological age-stratified contacts between adolescents and more limited heterosexual relations. The hypothesis that distal cultural factors influence the character of the adolescent transition process was examined by Stattin, Kerr, Johansson, and Ruiselova (in press). The study was carried out at the same time in central Sweden and in eastern Slovakia. The tradition for young girls in that part of Slovakia does not promote girls' association with older boys or males and is more conservative about early sexual relations relative to the situation for Swedish adolescents. Stattin et al. found empirical support for the idea that under these conditions differences in menarche age did not have the same relation to current behavior as in Sweden. For Swedish girls, early pubertal development was an

instigation condition for heterosexual relations, and the early-developed girls were more norm violative than the later developed. This was not true for Slovakian girls. Overall, these findings are in agreement with the idea that sociocultural factors influences the association between pubertal timing and social behavior. Within a culture, similar processes may operate. Caspi and Moffitt (1991), in a study for a sample of New Zealand girls, found the same early maturation deviance but only if the girls' school was coeducational. Presumably the opportunities for association with older, working boys were greater in the coeducational setting than in all-girl schools.

Summary

This section summarizes and refers to a number of empirical studies on specific aspects of environments and their significance for individual development. Taken together, they demonstrate the broad range of proximal and distal aspects of the environment that are involved in individuals' current functioning and in the developmental processes that should be considered in a general model for these processes.

For a proper interpretation of the empirical studies we have referred to, it should be observed that individuals' adaptation to and handling of environmental conditions is a complex, dynamic process that needs a general, overriding theoretical framework in the final analyses of individual developmental processes. With few exceptions, the studies reported here have dealt with one or a few environmental components at a time at the group level, applying unidirectional models for PE relations. This approach has contributed to the identification of possible working environmental factors in the developmental processes. Empirical research has seldom dealt with the process of interaction in which environmental conditions operate at the individual level. The implications for theorizing about developmental processes are dealt with in a later section on measurement models.

One of the major challenges for further progress in research on the role of environmental factors in developmental processes is to develop and apply strategies and measurement tools that are appropriate for studying this issue at the level of the individual. This is an exceedingly difficult task but that cannot be a reason for not attempting it.

BASIC PRINCIPLES OF THE HOLISTIC-INTERACTIONISTIC MODEL

As we emphasized in the introduction, the holistic-interactionistic model is not an empty conceptual box; it contains fundamental principles that are characteristic features of the processes of individual development. Further scientific progress in research in this field presupposes consideration of these principles in the design, implementation, and interpretation of studies on specific aspects of developmental processes, independent of sex, age, and culture. In this section, we propose and discuss a number of what we regard as basic principles.

The Holistic Principle: From Variables to Individuals

The term "variable" is one of the most misused concepts in psychological research. Misunderstanding is sometimes due to the concept being used in two distinctly different senses: as a psychological concept reflecting a certain aspect of individual functioning, say intelligence or aggressiveness, and as a statistical concept, referring to the measurement level of data. It may be worth reviewing the original definition of a variable in mathematics: "a quantity that may assume any value or set of values." In psychology, the meaning has been extended to "a factor, in individuals and/or in the context that may vary across individuals." One of the misuses of the variable concept is associated with the common tendency to reify psychological phenomena as hypothetical constructs (e.g., Bergman & Magnusson, 1990). Hypothetical constructs are basically inferential in nature; they reflect aspects of the integrated, dynamic functioning of the individual but do not exist as separate structural units. An individual can function in an intelligent, dependent, or helpless way, but intelligence, dependence, and helplessness do not exist per se. Hypothetical constructs at the measurement level are usually referred to as "latent variables." Borsboom, Mellenbergh, and van Heerden (2003) recently examined the theoretical status of latent variables as used in modern test theory and argued that the application of such models requires "a realistic ontology of latent variables." This demand is not restricted to the study of latent variables in the application of test theory. It is equally valid when the concept of latent variables is

used in other measurements of situations involving hypothetical variables.

The integrated, holistic nature of developmental processes implies, among other things, that they go on and develop as irreducible wholes and cannot be decomposed into or understood as independent components. The holistic view of processes in nature has old roots. A formulation by Carl von Linné is appropriate here: "such a relation exists between all parts, that if just one disappeared, the whole would not last" (Broberg, 1978, p. 29). It is also a main proposition in modern models for complex dynamic processes. Accordingly, the whole picture conveys information that extends beyond what is contained in the separate parts. "The doctrine of epigenesis" is defined as: "Behavior, whether social or unsocial, is appropriately viewed in terms of an organized system and its explanation requires a holistic analysis" (Cairns, 1979, p. 325).

The uniqueness of an individual's life processes imply that a single component does not necessarily have the same psychological significance in the developmental processes for all individuals, independent of other, simultaneously working components of individual functioning. In the IDA longitudinal study, Magnusson and Bergman (1990) observed that data for aggressiveness in childhood was significantly related to data for adult criminality for males. Further analyses supported the hypothesis that the significant correlation between early aggressiveness and adult criminality was largely accounted for by males who as children had shown a combination of aggressiveness, motor restlessness, lack of concentration, poor peer relations, and other problem behaviors. When this multiproblem group of males was excluded from the sample, data for early aggressiveness no longer predicted data for adult criminality. In the same way, divorce in the family does not affect children independent of other aspects of family life and family relations. It is detrimental when it appears together with other risk factors (Stattin & Magnusson, 1996). The same holds for other aspects of upbringing conditions such as criminality, alcohol problems, and unemployment in the family.

The holistic principle holds for all systems, regardless of the level at which they operate. It holds at the cellular level, at the level of subsystems such as the coronary system, the immune system, the cardiovascular system, the cognitive system, and the behavioral system, as well as at the level of the individual as a total system. It also holds for the environment and its subsystems, such as the peer system among youngsters, as well as for the total PE system. Discussing the role of culture in human development, Wills (1993) stated: "It is primarily the elaborateness of culture, rather than any of its specific features, that has driven the evolution of the brain" (p. 42). Arguing for a holistic approach, Barrien Moore (2000), chairman of The International Geosphere-Biosphere Program (IGBP) concluded in a discussion about the challenges for future research on earth's life support system:

> [F]irst, the Earth functions as a system, with properties and behavior that are characteristic of the system as a whole. . . . Understanding components of the Earth System is critically important, but is insufficient on its own to understand the functioning of the Earth Systems as a whole. (p. 1)

In general terms, a holistic approach to individual functioning has been discussed for some time (e.g., Allport, 1937; Lewin, 1935; Russell, 1970; Sroufe, 1979). Mischel (2004) presented an overview of the historical development of this approach in personality research and of the present state of the art. In developmental research, a holistic view was advocated by a number of authors (Cairns, 1979; Emde, 1994; Ford, 1987; Lerner, 1984, 1990; Magnusson 1988; Sameroff, 1983; Wapner & Kaplan, 1983; Wolff, 1981). The implication of this view was expressed by Husén (1989), in discussing the challenges for the future of educational research: "we are now facing a paradigm shift from the overgeneralizations and abstractions of the Cartesian philosophy of man and Newtonian mechanics to a celebration of the individual and the unique" (p. 357).

Implications

Although proximal and distal environmental factors are involved in the developmental processes of an individual, not one of these factors acquires its significance in the process per se, only by the role it plays in the totality. In the mind of the person, each aspect constitutes an element in an integrated process and its significance and importance are to some extent unique for the individual. The same applies to each component in the functioning of the mind in current situations and in developmental processes. Accordingly, consideration of the holistic principle is essential for real scientific understanding of

both current behavior and developmental processes of the individual.

The holistic principle has fundamental consequences for the choice and application of appropriate methodologies and research strategies in empirical research on specific aspects of human functioning, both in a current and in a developmental perspective. A central implication is that the total process, which is the focus of interest in a particular study, cannot be finally understood by investigating single aspects isolated from other simultaneously operating components. For example, if we only think of single cells, we will not understand the functioning of the systems in which they work (e.g., Levi-Montalcini, 1988).

Neither the functioning of the individual nor developmental changes can be understood by summing results from studies of single aspects, a point that Allport made forcefully in 1924. As a consequence, the traditional variable-oriented approach needs to be complemented with a *person approach,* which considers a holistic-interactionistic framework (e.g., Magnusson, 2003).

Adoption of the holistic principle does not imply that specific mental, behavioral, and biological aspects of individual functioning and development should not be the object of empirical research. The warnings by Mayr (1976) with respect to biology are equally applicable to psychology: "The past history of biology has shown that progress is equally inhibited by an anti-intellectual holism and a purely atomistic reductionism" (p. 72). There is no real contradiction between a holistic approach to theoretical analyses and empirical investigations of specific mechanisms that are operating, in the processes underlying why an individual thinks, feels, acts, and reacts as he or she does (e.g., McCall, 1981). The formulation of the theory of evolution by Darwin in 1859 did not obstruct theorizing and empirical research on specific issues in life sciences. On the contrary, acceptance and application of the basic principles of natural selection in the theory of evolution laid the foundation for real scientific progress in research on living organisms.

Transformation, Emergence, and Novelty in Structures and Processes

Some theorizing and empirical research seems to assume implicitly that individual development is a matter of adding new elements to the existing ones in a process of accumulation or acquiring more of the same. Rather, individual development is a continuous process of restructuring, at the subsystem as well as the whole system level, within the boundaries set by psychobiological and environmental constraints:

> Throughout development, the child or animal refines properties of its expression, combines previously isolated properties together into new packages, and opens up new windows of receptivity to its world while closing other windows on the way to establishing a unique individuality. (Fentress, 1989, p. 35)

A change in one aspect affects related parts of the subsystem and sometimes the whole organism. Mayr (1997) emphasized the concept of emergence as one of the two major pillars of a holistic view on living organisms: "that in a structured system, new properties emerge at higher levels of interaction which could not have been predicted from a knowledge of the lower-level components" (p. 19). At a more general level, the restructuring of structures and processes at the individual level is embedded in and part of the restructuring of the total PE system.[5]

Accordingly, individual development implies continuous reorganization of existing patterns of structures and processes and creation of new ones. Sometimes totally novel behaviors appear. Research from the longitudinal program at Chapel Hill is illustrative (Cairns, Cairns, Neckerman., Fergusson, & Gariépy, 1989). In late childhood, girls develop new techniques of aggressive expression, including the ability to ostracize and ridicule peers in such a way that the target is unaware of who is attacking her. Females employ this strategy with increasing frequency in late adolescence. Boys, on the other hand, are more characterized by the developmental continuation of confrontational techniques that leave them open to direct and violent reprisals. What on the surface seems to be the same behavior for all individuals at various age levels may differ in its psychological significance for different individuals of the same age and for the same individual over time. This consequence of the

[5] In the life-span perspective, novelty implies both growth and decline in structures and processes, as emphasized by Baltes (1987).

principle of novelty in the holistic, integrated developmental process of an individual is often ignored in traditional developmental research.

Functional Interaction

Much of the debate on individual functioning in the framework of classical interactionism has been based on empirical studies that investigated person-environment interactions across individuals in statistical terms at the group level, using traditional experimental designs. In contrast, a fundamental characteristic of the processes of all living organisms at all levels is functional interaction among operating factors at the individual level (Miller, 1978; von Bertalanffy, 1968). Components of open systems do not function in isolation, and usually do not function interdependently in a linear manner within individuals. The processes are much more complex, particularly when mental, biological, and behavioral components are involved in joint operations.

Functional interaction is a characteristic of the developmental process of an individual in the life-span perspective; from the interaction that takes place between single cells in the early development of the fetus (e.g., Edelman, 1989; O'Leary, 1996) to the individual's interplay with his or her environment across the life span. The building blocks of all biological organs are the cells. Behind individual development as an organized, functional totality from a single cell lies the process of interaction among cells. Each cell develops, functions, and dies as a result of cell-cell interaction in which information is received from and sent to neighboring cells. The application of techniques from molecular biology and biophysics to unicellular model systems and nowadays even to transgenic organisms has opened up new avenues to an understanding of the mechanisms that regulate the growth, division, and development of new forms of cells and cell structures. In biological sciences, interaction is a central concept in models for the functioning and development of all living organisms, as emphasized by Mayr (2000b). In the annual report for 1998/1999 from the Swedish Council for Research in Natural Sciences, a central chapter was devoted to discussing the fundamental role of interaction in biological processes from cellular protein to brain level (Lindberg, 2000).[6]

Reciprocity and Interdependence

As pointed out earlier, a strong assumption in traditional, variable-oriented psychological research concerns unidirectional causality. Unidirectional influences on individual functioning with temporary and long-term developmental consequences obviously exist. For example, the outdoor temperature unidirectionally affects the individual's choice of clothes and in some respects his or her behavior. Interestingly, there are empirical studies that indicate that some aspects of an individual's development are related to the season of birth (e.g., Kihlbom & Johansson, 2004). To a varying extent across proximal and distal environments, individual lives take place and develop within boundaries set by existing norms, rules, and regulations.

Nevertheless, a primary feature in dynamic complex processes is the dynamic interaction of operating factors. Reciprocity and interdependence are features of the processes at all levels of individual functioning and of the PE system: They are a feature of the relationship between cells and their context in the womb during pregnancy, the way psychobiological components are integrated within the individual, the way in which individuals relate in the socialization process, and the way an individual relates to the environment (Bell, 1971; Caspi, 1987). In classical interactionism, person-person interaction was seen as a good illustration of the principle. Reciprocity among operating factors contributes to developmental change in the functioning of the total system:

> The basic principle underlying reciprocal influences in development arising from parent-offspring interaction is that of a moving bidirectional system in which the responses of each participant serve not only as the stimuli for the other but also change as a result of the stimuli exchanges, leading to the possibility of extended response on the part of the other. (Bell, 1971, p. 822)

As emphasized in a modern interactionistic view, functional interaction is also a fundamental principle in psychobiological processes within the individual. In a

[6] An example of the misunderstanding of the role of statistics is the demand that the existence of dynamic interaction in developmental processes should be proved by statistical models for the study of interaction in data sets. Functional interaction as a characteristic of developmental processes should be distinguished from statistical interaction models as tools in the treatment of data. In principle, they have only the word interaction in common (Magnusson, 2001).

discussion of the immune system, Maier and Watkins (2000) concluded:

> The brain and the immune system form a bidirectional communication network in which the immune system operates as a sense organ to provide the brain with information about infection and injury, thereby allowing the brain to coordinate a defense. Activated immune cells release proteins called cytokines, which signal the brain by both blood and neural routes. Information that reaches the brain across this sensory channel produces large changes in neural activity, behavior, mood, and cognitive functioning. Appreciation of the functioning of this network may illuminate poorly understood aspects of stress, depression, and intraindividual variability in behavior, mood, and cognition. (pp. 98–112)

Nonlinearity

As stated previously, much psychological research is focused on the statistical relations among variables at the group level. The most frequently used methods assume (a) that the relation among the variables is linear across individuals, and (b) that the relation obtained across individuals holds for the relation among factors operating within an individual.

Our concern here is linearity versus nonlinearity in the interrelations among components operating at the individual level. Nonlinearity, more often than linearity, is a characteristic of individual processes. The principle implies, for example, that the effect of hormone A on the dependent hormone B is not necessarily linear; the relation may assume very different functions. The same holds true for the interplay of a single individual with his or her environment. For example, individuals' psychological and physiological stress reactions to increasing stimulation from the environment are often nonlinear. The inverted U-relation found between performance as well as psychological and physiological stress reactions for individuals, on the one hand, and the strength of the demand from the environment, on the other, is one example. The nonlinear function for the relation between two operating person-bound factors or the relation between the individual and his or her environment may differ among individuals.

Causality in Functional Interaction

Understanding an individual's way of functioning and developing includes a discussion about causal mechanisms. These mechanisms are of special concern when discussing models of the processes by which individuals develop. Understanding causal mechanisms is also a prerequisite for effective intervention. The discussion here is related to the distinctions made in an earlier section titled: Three General Approaches to Person-Environment Relations.

At a metatheoretical level it is possible to distinguish three main causal models of relevance for the discussion here: the mentalistic, the biological, and the environmentalistic model (Magnusson, 1990). The main distinction concerns the focus each approach employs with regard to interpreting the main factors presumed to guide individual functioning and development. Few scholars are likely to identify themselves explicitly as representatives of either category. However, we argue that the models exist and affect what researchers actually do and discuss.

The mentalistic model emphasizes mental factors as the central ones for understanding why individuals function and develop as they do. The focus of interest in theorizing and empirical analyses is on intrapsychic processes of perceptions, thoughts, emotions, values, goals, plans, and conflicts.

In the *biological model,* an individual's thoughts, feelings, actions, and reactions are assumed to be determined basically by his or her biological equipment and its way of functioning. Primary determining factors are assumed to be found in the brain, the physiological system, and the autonomic nervous system. When biological models of individual development are applied, the major determining guiding factors are genetic and maturational. In its extreme version, this model implies that individual differences in the course of development have their roots in genes, while environmental and mental factors play a minor role.

The environmentalistic model locates the main causal factors for individual functioning and development in the environment. It is reflected in theories and models at all levels of generality for environmental factors: macro social theories, theories about the role of the "sick family" and S-R models for specific individual variables, are a few examples. The environmentalistic model has been very influential in developmental research.

In much traditional research, a common characteristic of the three general models is their assumption of unidirectional causality; mental factors are the main causes of behavior, and biological factors and environmental

factors, respectively, are implicitly assumed to be the basic determinants of mental activities and behavior.

In theoretical and empirical research, each of the metatheoretical approaches to understanding basic causal mechanisms has had and still has a strong, sometimes dominant impact. They have also had far-reaching implications for how societal issues have been discussed and handled, as well as for psychological application, for example, in discussions of appropriate treatment of mental illnesses. Their existence reflects a fragmentation of the field into subdisciplines in content, concepts, research strategy, and methodology and diversifies research into specialties with little or no contact across domains. Nothing is wrong with each of the three explanatory models themselves. The problem arises when each of them is assumed, mostly implicitly and without discussion, to be sufficient or at least the most important for psychology as a scientific discipline. This has hampered real progress in both research and application.

Perceptual, cognitive-emotional, biological, and behavioral components of an individual's functioning, and the perceived and interpreted aspects of the environment, are involved in a continuous loop of functional interaction in a current situation. Individual functioning as well as developmental processes are multidetermined and function and develop in a complex and dynamic way. From this perspective, Gottlieb (2003) discussed developmental causality in terms of "co-action."

This perspective implies that the concepts of independent and dependent variables and of predictors and criteria lose the absolute meaning they have in traditional research assuming unidirectional causality. What may function as a criterion or dependent variable in statistical analyses at a certain stage of a process, may at the next stage serve as a predictor or independent variable.

Temporality

Another central concept in a holistic-interactionistic model is that of process. A "process" can be characterized as a continuous flow of interrelated, interdependent events. This definition introduces time as a fundamental element in any model for individual functioning and development. In modern models of dynamic processes, a central concept is motion. Further, key aspects of biological processes are rhythm and periodicity (Weiner, 1989). Faulconer and Williams (1985), drawing on Heidegger, emphasized the importance of annexing temporality in our endeavors to understand individual functioning. Without the principle of temporality, the fundamental dynamic aspect of the processes of current functioning and development is ignored (e.g., Dixon & Lerner, 1988). The earlier referenced study by Li et al. (2004) shows how cognitive structure varies across ages in a nonlinear way and empirically demonstrates the importance of considering the temporal aspect of central individual processes in life-span research.

The temporal perspective varies with the character of the system under consideration. Individual differences in biological age among girls had consequences for current behavior during puberty and early adolescence but also for the further lifestyle in unexpected ways. Processes in systems at a lower level are generally characterized by shorter time perspectives than processes at a higher level. Cairns and Cairns (1985) made a distinction between short-term interactions in the perspective of seconds and minutes and developmental interactions in the perspective of months and years. They proposed that social learning processes, which are central for short-term, current adaptations, may be reversed or overwhelmed in the long-term by slower-acting maturational, biosocial processes (see also Riegel, 1975, in his presentation of a dialectical theory of development).

The pace at which structures and processes in the individual change as a result of maturation and experiences varies with the nature of the systems, especially the level of subsystems (see the discussion by Lerner, Skinner, & Sorell, 1980, about "nonequivalent temporal metric"). The anatomical structure of the fetus changes, as a result of cell-context interaction, much faster than the individual changes during adolescence. P. W. Sternberg (2004) pointed to a characteristic feature of cell development that should be considered in research on the development of biological mechanisms at the basic level, by stating:

> The amazing precision with which different cell types find their correct location in developing tissues has fascinated biologists for decades. Models of cell fate patterning during development emphasize the contrast between spatial gradients of developmental signals that act at long range and cell-to-cell signaling events that act locally. (p. 637)

Since systems at various levels are embedded in each other and components are involved in a dynamic interaction, the temporal perspective does not apply to only one subsystem at a time. Rather, the coordination and synchronization of system components with different time scales is critical.

Implications

To understand them, transformation processes must be followed over time. Short-term processes can be followed, observed, and studied by applying an experimental design. For long-term processes (e.g., pubertal change), the most frequent approach is systematized observation over time: a longitudinal study. Only by following girls up to adult age could the relevance of the teenage behavior in life course be traced in our study of biological age.

A fundamental circumstance with decisive consequences for empirical research is the existence of sometimes very strong interindividual differences with respect to the pace of developmental transformation processes. The study of individual differences in biological maturation among teenage girls, referred to above, demonstrates the inadequacy of cross-sectional studies on long-term developmental processes. Overwhelming numbers of empirical studies on adolescence have been and are being performed with reference to data from samples of a certain chronological age. The effect is to introduce an irrelevant and, with respect to size, unknown part of the total variance in sample data. Studying problems among girls at that age using a cross-sectional design, without considering the interindividual differences in the psychobiological timing of pubertal processes, may lead to erroneous conclusions and to negative consequences for the girls if the results are used as a basis for interventions.

Organization

The holistic-interactionistic model does not imply that developmental processes are random. A fundamental basis for the scientific analysis of individual development is the proposition that processes are guided by basic principles and specific mechanisms in structures that are organized and function as patterns of operating factors at all levels of the individual. Organs and components of organs constitute functional units of the total, integrated organism. Principles and mechanisms in the orderly organization serve to maintain integration and stability both of current functioning and of developmental change.

The orderly organization of behavior in a developmental perspective was emphasized and discussed by Fentress (1989). An interesting question is whether the differences between early development and aging are essentially a discontinuity in organizational directionality toward more as opposed to less organization (Baltes & Graf, 1996).

One basic, well-documented principle in the development of biological systems is their ability for self-organization, a characteristic of open systems, which refers to a transformation process by which new structures and patterns emerge (see Kelso, 2001, for an overview, and Barton, 1994, for a discussion of self-organization in developmental processes). From the beginning of fetal development, self-organization is a guiding principle. "Finality in the living world thus originates from the idea of organism, because the parts have to produce each other, because they have to associate to form the whole, because, as Kant said, living beings must be 'self-organized' " (Jacob, 1976, p. 89).

Within subsystems, the operating components organize themselves to maximize the functioning of each subsystem with respect to its purpose in the total system, as higher level subsystems organize themselves to fulfill their role in the totality. Self-organization is a fundamental principle in living cells (e.g., Hess and Mikhailov, 1994). This principle is found in the development and functioning of the brain, the coronary system, and the immune system.

> The strength and indeed the very preservation of nascent connections between neurons appear to depend on patterns of neural activity in the developing nervous system and these patterns of activity vary among individuals—at best they are only statistically regular—so that detailed wiring of each individual's brain is distinct. (Stryker, 1994, p. 1244)

The principle can also be applied to the development and functioning of the sensory and cognitive systems and to manifest behavior (see M. Carlson, Earls, & Todd, 1988).

Individual Differences

Two aspects of self-organization are pertinent for the discussion here. First, individuals differ in the way in which operational factors are organized and function within subsystems, which, in turn, also differ in organization and function. These organizations can be described as patterns of operating components within subsystems and as patterns of functioning subsystems. Weiner (1989) suggested that even the oscillations produced by the natural pacemakers of the heart, the stomach, and the brain are patterned.

In psychology, the idea of patterning is not new. Galton (1869) concluded that some people are more intelligent than others and each person's pattern of intellectual abilities is unique. A common way of presenting analyses of individual differences with respect to intellectual resources is in profiles representing patterns. Based on their own children's diaries, pioneers of child psychology such as Preyer (1908), Shinn (1900), and W. Stern (1914) described and discussed individual differences in developmental changes of patterns. Patterning of individual characteristics was also reflected in longitudinal research on child development in the period of 1930 to 1950 (see Thomae, 1979).

Second, the number of ways in which operating factors in a certain subsystem can be organized in patterns and the number of ways in which subsystems can be organized for the whole organism is restricted (e.g., Gangestad & Snyder, 1985, who argued for the existence of distinct personality types, with reference to shared sources of influence). Only a limited number of states are functional for each subsystem and for the totality (e.g., Bergman & Magnusson, 1991; Sapolsky, 1994). In the multidimensional space, individuals with similar patterns of working components form "dense points" (see the discussion about the crystallization hypothesis).

Complementary to the assumption of "dense points" in the multidimensional space is the assumption of "white spots," patterns of working components at a certain level that, for psychological and/or biological reasons, cannot occur (see Bergman, 1988b; Bergman & Magnusson, 1997). The identification of white spots, and of extreme and deviant developmental paths, might be as important as the study of dense points for understanding developmental processes in general (e.g., Caprara & Zimbardo, 1996; Kagan, Snidman, & Arcus, 1998).

Patterning as a basic characteristic of subsystem functioning can be illustrated with objective data from biological research. Studying cardiovascular responses in a stressful situation, Gramer and Huber (1994) found that the subjects could be assigned to one of three groups on the basis of their distinct pattern of values for systolic blood pressure, diastolic blood pressure, and heart rate as shown in Figure 8.1. A similar study on cardiovascular responses was reported by Mills et al. (1994).

The data presented by Gramer and Huber represent a momentary picture of individual functioning in terms of patterns. How individuals can be grouped on the basis of their distinctly different biological processes has been demonstrated, among others, by Packer, Medina, Yushak, and Meller (1983), who studied the haemodynamic effects of Captopril in patients with severe heart problems. Together, these results reflect a basic principle underlying individual differences in development: at all levels of organization, individual development is manifested in patterns of operating factors.

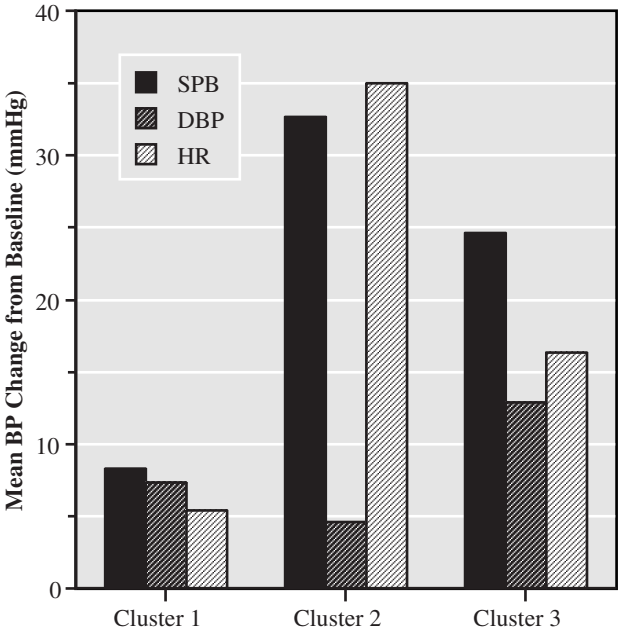


Figure 8.1 Magnitude of SBP, DBP, and HR reactivity in cardiovascular response clusters during speech preparation. *Source:* From "Individual Variability in Task-Specific Cardiovascular Response Patterns during Psychological Challenge" by M. Gramer and H. P. Huber, 1994, *German Journal of Psychology, 18,* pp. 1–17.

Organization of the Environment and the Person-Environment System

Organization is also a fundamental characteristic of the external environment, in all its manifestations. Both the physical and the sociocultural environment are structured and organized. The study of the nature of societal institutions and their organization by age, gender, and social class is fundamental to life-course sociology (see Elder, 1998). Of particular interest is the organization of the environment in how it is perceived and interpreted by the individual, through the eye of the beholder. As developing, evolving individuals, we strive for coherence in the world and of ourselves in the world. Particularly salient to the discussion about person-environment interactions is the individual's inborn striving for mental organization of the social environments, in families, peer relations, and other social networks (e.g., Kelvin, 1969). The organization of the environment as it is perceived

and interpreted by the individual in organized patterns and structures is a necessary condition for the individual's ability to deal effectively with and assign meaning to the enormous amount of information that is available at each moment of the person-environment interaction process, and for the individual to use the information for adequate and effective actions. One of the most important tasks for a child's caretaker is to act in a way that helps the child to develop valid and trustful mental organizations of the social world (Costanzo, 1991; Trevarthen & Aitken, 2001, p. 30).

Integration of Processes: Synthesis

At all levels of the dynamic, complex processes, the functioning parts are coordinated in their operations so as to serve the goal of the system to which they belong. This principle holds for parts of subsystems at all levels as well as for the coordination of subsystems in the functioning of the totality. Integration is the principle behind the fact that the total is not only more but something else than the sum of its parts.

Summary

This section has been devoted to the discussion of basic principles that hold for the developmental processes of all individuals. These principles must be considered in theoretical and empirical research on specific aspects of developmental processes. Of course, the principles discussed here are not to be regarded as a final complete list of basic principles, with respect to either number or content. Further theoretical and empirical analyses will certainly modify the list, as with normal scientific development in any area. Our aim here is to emphasize that without consideration of these basic principles, the results of statistical analyses may be statistically significant, but still run the risk of being irrelevant as a basis for understanding the individual processes.

THEORETICAL AND METHODOLOGICAL IMPLICATIONS

A characteristic feature of scientific progress in empirical sciences is increasing specialization. When specialization in a subfield of the natural sciences has reached a certain level, it becomes apparent that further progress lies in integration with what has been achieved in neighboring disciplines. In the introduction, we drew attention to the role of the theory of evolution for scientific progress in biological sciences. In general, the most important steps forward in natural sciences have been taken by integration at the interfaces of what were earlier conspicuously different disciplines; for example, at the interface of physics and chemistry and later at the interface of biology, chemistry, and physics. The earlier unambiguous and clear boundaries between subdisciplines changed to new disciplines, as scientific progress toward a better understanding of the physical and biological world required general models of nature.

We have briefly referred to what is the rule in natural sciences, including biology, to emphasize the fundamental role played by an overriding general theoretical framework for progress in those disciplines: The same holds for psychology as a scientific discipline. A general theoretical framework, a general model of the individual and society, is sorely needed for further, real progress in research on human ontogeny. The holistic-interactionistic model for individual development is suggested to meet that need.

The basic principles of the holistic-interactionistic model—the holistic principle, transformation with emergence and novelty, functional interaction, temporality, organization, and synthesis—have decisive consequences for the planning, implementation, and interpretation of empirical studies when the task is to contribute to the understanding of developmental processes. Now, that this perspective is increasingly accepted theoretically, the scientific challenge is to take its consequences seriously in empirical research.

To dispel a common misunderstanding and criticism, let us emphasize again that a holistic, integrated model for individual functioning and development does not imply that the entire system of an individual must be studied in every research endeavor. The acceptance of a common model of nature in natural sciences has never meant that the whole universe should be investigated in every study of specific problems.

Toward a Developmental Science

A consequence of the view advocated here is that for a full understanding and explanation of the developmental processes of individuals, knowledge from what is traditionally incorporated in developmental psychology is not enough. We need contributions from the interface of a number of traditional scientific disciplines: developmental biology, cognitive sciences, developmental psychology, physiology, endocrinology, neuropsychology,

social psychology, sociology, anthropology, and neighboring disciplines. The total space of phenomena involved in the process of lifelong individual development forms a clearly defined and delimited domain for scientific discovery. This domain constitutes a scientific discipline of its own, developmental science (Cairns, 2000; Magnusson, 1999b, 2000; Magnusson & Cairns, 1996). The contributions by excellent scientists—representing different aspects of individual development, from the fetal period to aging and from the cellular level to the interdependence of biology and culture—at a Nobel symposium under the auspices of the Royal Swedish Academy of Sciences in 1994, conspicuously attested to the underlying principles and the need for the establishment of Developmental Science (Magnusson, 1996b). The organization of research on individual development in the interface of well-established disciplines is in line with the growing urge for cross-disciplinary collaboration (e.g., Kafatos & Elsner, 2004). The proposition that research on individual development constitutes a field of research with its special demands on theory, methodology, and research strategy, does not mean that psychology loses its identity as a scientific discipline. Physics, chemistry, and biology did not lose their special merits as a result of the new developments at their interfaces. Contributing essential knowledge to developmental science instead strengthens psychology as an active partner in the mainstream of scientific progress.

Methodological Implications: Looking for Mechanisms

At an early stage, we proposed three main tasks for psychological research; the third was to identify the *mechanisms* that guide the operation of working factors in individual functioning and developmental processes. This goal requires the application of methodological tools that are explicitly linked to the character of the relevant phenomena and considering the basic principles of developmental processes.

The formulation of holistic interactionism draws attention to some earlier methodological issues of developmental research and raises some new ones. If the basic principles of the holistic-interactionistic model are taken seriously, there are specific implications for planning, implementing, and interpreting empirical studies.

Nature of Phenomena: Levels of Analysis

The nature of the structures and processes involved at different levels of the integrated person-environment system varies. The fundamental consequence is that it is not possible to collapse one level into another in empirical research (e.g., Novikoff, 1945). A necessary condition for any proper interpretation of empirical data is that the researcher is aware of and makes explicit the level of the phenomena at which the problem is located and formulated. For example, analyses of trait data have theoretical consequences that differ from those which apply in analyses of state data for the same latent variable.

Accordingly, the starting point for planning empirical research on a specific topic is a careful, systematic analysis based on observation of the phenomena at the appropriate level (Cairns, 1986b; Magnusson, 1992). If this requirement is not met, even sophisticated analyses of the data will yield not only trivial but sometimes misleading results. The starting point for the analysis is always a question, which may be motivated by theoretical considerations, by results from experimentally designed studies, and/or by direct observations in natural settings of the phenomenon under investigation.

Tools in the Acquisition of Information: Methods for Data Collection

It follows from the foregoing discussion that a particular methodology cannot be applied regardless of the level and character of the structures about which a research problem has been formulated. There is no single scientific method that can be used for effective research on all types of problems. An individual's life course is a highly idiosyncratic process. As long as our aim is to contribute to the synthesis of knowledge about individual developmental processes, in the final analysis they must be analyzed with reference to their holistic character. Given the very large number of elements at all levels of the individual's integrated developmental processes, this proposition poses a real challenge for the development and application of appropriate tools for the acquisition of information.[7]

[7] Psychological subfields are sometimes defined through methods. An example is "experimental psychology," which has been and often still is regarded as the most prestigious area of psychological research. Cronbach (1954) in a frequently cited article separated two psychological disciplines with reference to methods: experimental and correlational psychology, respectively (cf. Cronbach, 1975). We claim that there is a single, integrated space of phenomena that is the target of scientific analysis of psychological phenomena.

In empirical research, the classical method for observation and acquisition of information is the experimental design. Experimental designs are also important tools in a study concerned with current or developmental processes. Such designs are indispensable and particularly useful for the study of short-term transformation processes, such as during the fetal period of life, and of brain development at the cellular level as an effect of external information, for instance, in brain research on learning (e.g., E. R. Kandel & Schwartz, 1982). O'Connor (2003) emphasized the advantages of natural experiments in research on early experiences. This research strategy is an important tool both in experimental research on short-term processes and in studies on developmental processes over longer periods (e.g., Cairns, 1986a; Cairns & Rodkin, 1998).

The focus of this chapter is on individual development as a dynamic process of change across the life span. The basic principles that characterize the target of analysis restrict the application of the classical experimental design in empirical studies on basic developmental issues. The main reasons for this conclusion are the individuality of the processes and the individual differences in the way the basic principles of developmental processes function simultaneously. In this situation, systematized observation becomes an indispensable complementary tool. The history of science is full of illustrations to support this proposition. Charles Darwin's theory of evolution was based on his systematization of careful observations. Johannes Kepler's ingenious trio of laws for the earth's movement around the sun stemmed from Tycho Brahe's careful and systematic observations of the movement of the planets. Carl von Linnaeus's system for the categorization of plants was likewise the result of systematic observations, as was Fleming's discovery of penicillin. These contributions are only examples of all those that have formed the necessary conditions for further theoretical progress in their respective disciplines.

The basic principles of developmental processes lead to the conclusion that progress in research on working mechanisms requires further development and application of appropriate methods for systematic observation and description under controlled conditions. Sometimes nature offers conditions for systematized observation. An illustration of how knowledge can be obtained by observations that use variation in natural conditions for the study of basic psychological phenomena is Luria's (1976) study of language, self-perceptions, perceptions of others, and perceptions of the world. Studies of monozygotic and dizygotic twins, reared together or apart, offer another illustration (e.g., Bohman, Cloninger, Sigvardsson, & von Knorring, 1982; Haugaard & Hazan, 2003). In research on evolution, descriptive analyses based on systematic observation in varying forms plays a fundamental role. The same is the case in longitudinal research, aiming at understanding individual development as a life-span process, characterized by the basic principles summarized earlier.

Our understanding of individual and environmental functioning and of the functioning of the total PE system—currently and developmentally—would also gain from extending the arsenal of methods to include qualitative methods, frequently and successfully applied in ethnographic research (e.g., Schweder et al., 1998). An applicable complement is the narrative approach in which individual life stories are analyzed (e.g., Sarbin, 1986; Singer, Slovak, Frierson, & York, 1998). Fiese et al. (1999) used a narrative approach in their studies of various aspects of family life. An illustration of the fruitfulness of this approach was presented by Manturzewska (1990) in her studies of the life-span development of professional musicians. With reference to Tomkins' (1979) "script theory," R. Carlson (1988) advocated the usefulness of psychobiographical inquiry in several areas of personality research development. The comprehensive interview data collected by Cairns and Cairns (1994) in their longitudinal study of adolescence yielded information that could not have been obtained in other ways.

Generalization

A characteristic of much empirical psychological research is its ethnocentrism. Research on the upbringing environment, which is normally associated with transition behaviors and the timing of developmental events, has mostly been done in Western European countries, Australia and New Zealand, and the United States. Although cultural and cross-cultural research has provided valuable information about other cultures, our knowledge about whether these correlates are similar in countries elsewhere is still limited. Even where such broader comparisons have been made, this has often been done with instruments developed and

validated on individuals in Western countries. This state of affairs raises the basic question about generalization of empirical results obtained for the functioning and development of different aspects of the total PE system at different levels (e.g., Baltes, Reese, & Nesselroade, 1988). How far are results obtained in one environmental context valid in others? The importance of this question has been conspicuously demonstrated in research on the role of individual differences in biological maturation and its long-term consequences. Empirical studies on this issue indicate the danger of generalizing results on developmental processes obtained in one cultural setting to other cultural settings, as a basis for general conclusions about the human nature.

Generalization of results from studies on specific issues is a goal of scientific research. In the tradition of experimental psychology, replicability has been regarded as the main criterion of the validity of results. Unsophisticated use of this rule has sometimes, for example, had the consequence that differences in results from studies on a specific issue in different cultures have been interpreted as errors. This motivates some comments.

In the search for possible operating factors and for mechanisms underlying the simultaneous operation of these factors, the basic principles of developmental processes have four main implications for the generalization of results.

First, results concerning possible operating factors in the developmental processes should not be generalized across age levels without careful consideration of the phenomena being studied.

Second, results cannot be generalized from one level of analysis to another, either with operating factors or working mechanisms. The interpretation of much empirical research assumes that relations between operating components in the individual and/or in the PE system, studied at group level, can be generalized to hold for the relations between the components in developmental processes at the individual level. This tradition still dominates the field, despite a serious debate about the lack of theoretical and empirical support (e.g., Bergman, 1998; Ford & Lerner, 1992; Magnusson, 1998; Nesselroade & Featherman, 1991). The incorrectness of the assumption was demonstrated recently by Molenaar, Huizenga, and Nesselroade (2002), using simulation procedure; they showed that in the extreme case, significant relations between operating components, studied at group level, did not hold for any individual (see also von Eye & Bergman, 2003). Borkenau and Ostendorf (1998) came to the same result with empirical studies on individuals.

Third, results cannot be generalized from group means to individuals. Lewin (1931) strongly argued for this proposition. For example, representative sample means for a specific performance at a certain age are sometimes used as reference points for the evaluation of performance by individuals or groups of individuals. However, any parent can observe that their child does not necessarily follow the age curves presented in developmental research. Using group means as a basis for conclusions about the complex, dynamic processes of the individual will inevitably conceal important mechanisms. Kagan, Snidman, and Arcus (1998) discussed and emphasized, with reference to empirical studies of children, the value of studying statistically extreme groups.

Fourth, results concerning possible operating factors in one cultural context cannot be generalized to others without careful considerations. Neither can results concerning the role of specific components operating in one generation be generalized to another generation independent of the nature of the structures and processes under study.

An example of cross-national differences, important to consider in generalization of results on individual development, is a series of studies on how German, Russian, and American children's beliefs about their ability relate to school performance. In general, few cross-national differences were found with respect to children's views of what factors are important for performance. However, American children systematically reported stronger beliefs that they could influence these factors and their performance. Despite this, considerably lower belief-school grade correlations were obtained for the American than European children (Little, Oettingen, Stetsenko, & Baltes, 1995; Oettingen, Little, Lindenberger, & Baltes, 1994). Silbereisen and coworkers have compared youngsters raised in the former East Germany with similar groups in West Germany with respect to correlates and background conditions of transition behaviors. Their analyses revealed that many correlates in the East were quite different from those of the West, while youngsters raised in West Germany were often similar to those found in U.S. studies. One illustration is the timing of leaving home (Silbereisen, Meschke, & Schwartz, 1996).

There are also differences in these respects between children from different Western countries. For example, the dating system has not existed in Western Europe to the same extent as in the United States, and that could mean, for example, that the impact of pubertal development might have quite different implications. The role of biological maturation during early adolescence supports this proposal. In some areas, the differences in sociocultural environments between the United States and Western European countries might be so great that it is hard to generalize about adolescents and young adults from one culture to the other. For example, the ecology of some big U.S. cities, with their ethnic compositions, physical structure, and demographic characteristics, is seldom found in Europe. Because the types of criminality, existence of gangs closely tied to certain neighborhoods, and so on, are heavily associated with the urban ecology, studies of violence and gang criminality in the United States do not readily apply to European communities (Shannon, 1988). Even within the United States, the proximal environment for a child or an adolescent in a small Midwest town may be radically different from that in New York or Los Angeles.

These examples demonstrate that what can be generalized about individual current functioning and the developmental processes from one culture to another are not results concerning the general role and relative importance of single operating factors (see, e.g., Baltes, 1979). Rather, what can be generalized are the mechanisms in the person-environment system working at the level of the individual. Necessarily, empirical research with that goal needs the theoretical framework that is provided by a general model for the human being in the environment. It is worth recognizing that differences in individual functioning and development, related to differences in social and cultural environments, contain important information that is valuable in the search for such mechanisms.

Of course, the issue of generalization also concerns the area of intervention and prevention. For example, preventive strategies that have proved effective for U.S. preschool children are not necessarily so when implemented in other cultures, among other things because the preschool infrastructure, the basic content, and the organizational structures of activities for children, differ markedly between countries.

Measurement Models

Methods are tools for analyzing data to understand the processes operating within given psychobiological structures and involved in developmental change. The development of sometimes sophisticated statistical tools has helped to strengthen empirical developmental research. However, for a correct application of statistical methods it is crucial to recognize that they are tools for analysis of data in the same way as axes, knives, and razors are tools for cutting. Tools are never good or bad in themselves. The appropriateness of a particular statistical method for a particular study depends on how effectively it contributes to a correct answer to the problem. The degree of statistical sophistication can never be a criterion of the scientific value of an empirical study.

Traditionally, statistics are most often applied in the following strategy framework:

$$\text{Problem} \rightarrow \text{data} \rightarrow \text{statistics}$$

No statistical tool has a value on its own in the research process, it is only when a statistical tool matches the character of the phenomena, that is, when it is linked to an analysis of the phenomena under investigation, that it can contribute scientifically solid answers to relevant questions. The claim here is that adequate application of any statistical method presupposes a research strategy that includes a measurement model linking the statistics to the problem; that is, the following general schemata:

$$\text{Problem} \rightarrow \text{measurement model} \rightarrow \text{data} \rightarrow \text{statistics}$$

Two basic complementary measurement models (MMs), with specific implications for the data to be used and the relevant statistical tools, were proposed by Magnusson (1998, 2003). The fundamental difference between both MMs lies in the way in which the psychological significance of a single datum—representing a response to a stimulus, a response to a test or questionnaire item, a rating of observed behavior, and so on—is derived. The theoretical framework for the conceptual distinction between both measurement models is expressed in what has been designated the variable approach and the person approach, respectively.

Measurement Model 1

According to measurement model 1 (MM1), *a single datum for individual A on a latent dimension k derives its psychological significance from its position on that dimension in relation to positions for other individuals, B, C, D, and so on* as shown in Figure 8.2a.

MM1 is the measurement model for what has been designated the *variable approach*. In general, empirical developmental research is dominated by the application of MM1. This is the case for most of the studies on the role of environmental conditions in the developmental processes of individuals, which we referenced earlier. The approach also dominates empirical studies on relationships among person-bound variables. The focus is on a single variable or a combination of variables, their interrelations (R-R and S-R relations), and their relations to a specific criterion. The problems are formulated in terms of variables and the results are interpreted and generalizations made in such terms. Commonly used statistical models include comparisons between means and other location parameters, correlation and regression analyses, factor analysis, structural equation modeling, contingency tables, and the original version of LISREL. An abundant arsenal of statistical tools is available and applied in these analyses (see, e.g., Bergman, Magnusson, & El-Khouri, 2003).

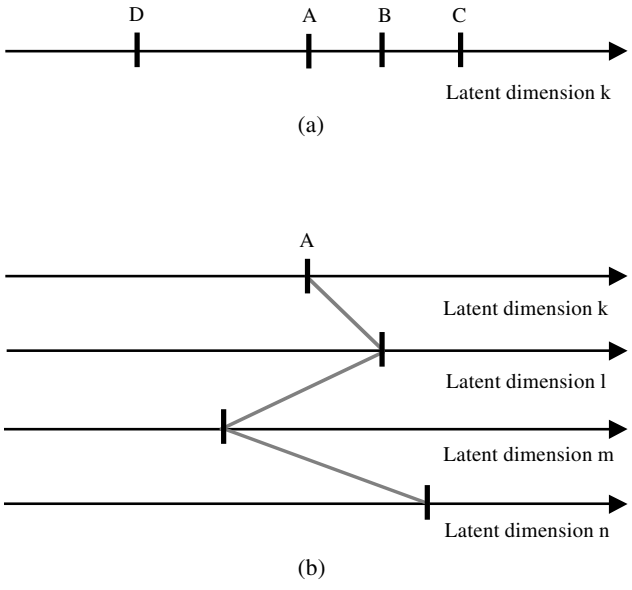


Figure 8.2 (a) Measurement model 1: The variable approach. (b) Measurement model 2: The person approach.

Two comments are pertinent for the discussion of the appropriateness of MM1 as the link between data and psychological phenomena.

1. Most of the statistics applied in these analyses are based on the assumptions of normal distributions of data for single variables and of linearity and homoscedasticity in the relation between variables (see Miccery, 1989, for a critical discussion of the assumption about normality). Reference is seldom made to a psychological model for developmental processes before these tools are applied. Classical test theory provides a good example (e.g., Magnusson, 1967).
2. Statistics applying MM1 yield answers to questions about variables at group level. The implication of the fact that generalizations are made in these terms, not in terms of individuals, was previously considered.

The most frequently applied statistics in research on individual development are linear regression models in the framework of MM1. In studies of developmental processes, the proper application of linear statistical models in that framework presupposes that the following interrelated assumptions are met (see Magnusson, 1998, p. 48).

1. Individuals can be compared on a nomothetic, continuous dimension in a meaningful way.
2. Individuals differ only quantitatively, not qualitatively, along the dimension for a certain variable.
3. Relationships between variables and their way of functioning in the totality of an individual are the same for all individuals. For example, using a multiple regression equation, each variable has the same weight for all individuals and reflects what is characteristic for the average individual.
4. The interrelations among variables studied in nomothetic analyses can be used to make inferences about how the variables function within individuals.

   In analyses of developmental issues, for example in analyses of the problem of stability and change in a developmental perspective, a fifth assumption should be valid.
5. The psychological significance and meaning of positions on the nomothetic scale should be the same quantitatively and qualitatively across ages.

These assumptions should be observed for the correct application of linear models in MM1. Two interrelated features of data matrices for individual variables are involved.

The first has to do with the existence of statistical colinearity at the data level, reflected in sometimes very high functional interrelations among the large number of operating components involved in most developmental processes (e.g., Darlington, 1968). At the individual level, the variables in the data analyses cover different aspects of the functioning of one and the same organism as a totality. Thus, it is not surprising that data pertaining to one latent variable also contains information about other, simultaneously operating latent variables in the process. The high correlations often found in data at group level, for example, among various aspects of manifest behavior such as aggression and motor restlessness, reflect the fact that they largely overlap with respect to content at the individual level. Therefore, studies of data for single variables will, sometimes greatly, overestimate the unique contribution of single components to the process of developmental change, as well as the unique role of specific aspects of the environment in these processes. The strength of this effect was empirically illustrated by Magnusson, Andersson, and Törestad (1993) in a study of the developmental background of adult alcohol problems. This effect is most often overlooked because frequently the role of only one or a few variables is studied and reported, independent of each other.

The second feature is the existence of statistical interactions among operating variables (e.g., Hinde & Dennis, 1986). To a certain extent, statistical interactions can be handled in, for example, structural modeling, but these possibilities are limited. As shown by Bergman (1988a), in spite of the existence of interactions in data, variable oriented linear analyses do not always consider these interactions when the model is tested against the correlation matrix.

From a historical point of view it is interesting to note that Baltes already in 1979, with reference to reviews of life-span developmental research, emphasized the inappropriateness of "one-factor" and unidimensional conceptions of development and concluded: "On the contrary, German writers have espoused a position that includes multidimensionality, multidirectionality, and discontinuity as key factors of any theory of human development through the life span" (p. 263). However, on the whole empirical research did not draw the necessary consequences of this important theoretical insight, namely that another measurement model than M1 is needed.

Measurement Model 2

According to measurement model 2 (MM2), *a single datum for individual A on a latent dimension k derives its psychological significance from its position in a configuration of data for the same individual, representing his or her positions on the latent dimensions k, l, m, n, and so on.* These latent dimensions are assumed to represent simultaneously working components in the system under investigation as shown in Figure 8.2b. MM2 is a logical consequence of the analysis of main characteristics of developmental processes in earlier sections; that is, it fits the characteristic features of the individual holistic developmental processes. Accordingly, MM2 is the appropriate measurement model for the choice of statistics in the final analyses of developmental processes at the level of the individual. An implication of MM2 is that statistics yield information about the individual, and generalizations refer to individuals.

The MM2 is the measurement model for what has been designated *the person approach*. Figure 8.3 illustrates the fundamental proposition that the same position for different individuals (A, E, and F) on a certain latent dimension may differ entirely in its significance in the integrated psychological, biological, and behavioral functioning of the three individuals. For example, the same level of aggressiveness in

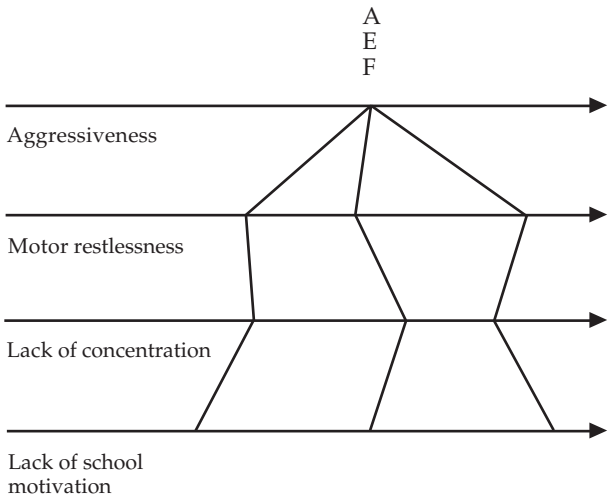


Figure 8.3 Fictitious profiles for three individuals (A, E, and F) based on data for four problem behaviors.

individuals A, E, and F has a different psychological significance in the individual patterns of other problem behaviors, including motor restlessness, lack of concentration, and lack of school motivation. The observation of high fever is an important indicator of illness. However, it is only when it has been assessed together with data for other, simultaneously working factors in the patient that it can lead to a final choice among possible diagnoses, a choice that can form the basis for relevant treatment. The importance of these illustrations follows as a consequence of the basic principles of developmental processes and was empirically demonstrated in a number of studies in our research group and elsewhere.

MM2 is applied for two main purposes:

1. The identification of groups of individuals who function in a similar way at the organism level and in a different way compared to other individuals at the same level. In data, individuals are categorized on the basis of individual profiles across relevant variables.
2. The analysis of short- and long-term developmental processes in terms of patterns. Models for dynamic, complex processes, derived from natural sciences, have contributed to the development and application of methods and models with consideration of the specific character of individual processes (Bergman, 2002).

Pattern Analysis of Individuals

In other scientific disciplines concerned with dynamic complex processes, such as ecology, meteorology, biology, and chemistry, pattern analysis has become an important methodological tool. In developmental psychology, it has been applied in a steadily increasing number of studies.

Two interrelated issues require special consideration in a proper pattern analysis of individuals. First, data should refer to the same level of individual functioning. Second, scaling of individual data included in the pattern analysis demands careful analysis of the nature of the variables because the scales of the different variables must be comparable. Rarely in psychology is this true without the application of special scaling procedures to the raw data. This scaling can be of different types, the most frequent solution being that the variables are standardized to make the scores in the different variables comparable and to ensure that a variable with a very large standard deviation does not dominate the pattern analysis. However, this is a medicine with side effects because it may be important to retain differences in variation between variables. Sometimes this can be achieved approximately, for instance by using quasi-absolute scaling. This issue was dealt with in detail by Bergman, Magnusson, and El-Khouri (2003, pp. 38–42).

With reference to different theoretical models of the phenomena being investigated, a number of methods for pattern analysis have been presented and applied: cluster analytical techniques (Bergman, 2002; Bock, 1987; Manly, 1994), Q-sort technique (Block, 1971; Ozer, 1993), latent profile analysis (LPA; Gibson, 1959), configural frequency analysis (CFA; Lienert & zur Oeveste, 1985), latent transition analysis (Collins & Wugalter, 1992), log-linear modeling (Bishop, Feinberg, & Holland, 1975), and multivariate P-technique factor analysis (Cattell, Cattell, & Rhymer, 1947; Nesselroade & Ford, 1987). (See also, Cronbach & Gleser, 1953, who discussed four cases for profile similarity.) Overviews and discussions of models were presented by Bergman et al. (2003) and von Eye and Bergman (2003).

For the study of developmental issues, the approach has primarily been applied in studies linking patterns observed at different ages. Relatively few attempts have been made to develop and apply methods for the empirical analyses of dynamic, developmental processes in patterns. For further progress in research on human ontogeny, an important challenge lies in the development and application of such methodological tools.

Individuality and Generalization

The emphasis on individuality naturally raises the problem of generalization to individuals from the cluster profiles. Two comments are pertinent.

1. All individuals referred to a certain cluster do not show exactly the same configurations of working components, reflected in the patterning of empirical data for that cluster (e.g., Bergman, 1988b). An implication of this is that empirical results of grouping individuals on patterns of data for relevant components can be used for the identification of general mechanisms in the functional processes of individuals belonging to the specific clusters, and for the study of inter-cluster differences. They cannot, however, except under very specific conditions, be used

for prediction, either of a single individual's behavior in a specific situation, or of the life course of a certain individual. In both cases, the actual outcome is dependent not only on the individual's mental, behavioral, and biological dispositions, which define his or her belongingness to one of the clusters, but also on the specific proximal and distal environmental conditions under which he or she lives and develops (see the discussion of plasticity).

2. Clusters in a super space for a system at a certain level do not imply a static view, classifying all individuals once and for all as types, in the classical sense, of the concept. The boundaries of many clusters are fuzzy and permeable. Some individuals' specific profiles do not belong to a specific cluster; all individuals cannot unambiguously be referred to one or the other of the main clusters (see Bergman, 1988b). Also, due to specific individual developmental paths, an individual may move from one cluster to another. Changes may result from changing psychobiological conditions (e.g., severe illness, progressive mental disease, and strong life events), changing environmental conditions, or a combination of the two.

Pattern Analysis of Environments and Person-Environment Systems

As emphasized earlier, the circumstance that both the physical and the sociocultural environments are structured and organized is a prerequisite for the individual's experiencing of them as meaningful and for the individual's purposeful actions. It is important to note that the psychological significance of a certain environmental aspect lies in the contribution it makes to a working, integrated pattern of such factors.

This view leads to the same conclusions for environments as for persons. Studies of single aspects of the environment, taken out of context, do not form the basis for understanding the role of the environment in the processes of individual functioning. Accordingly, the application of MM2 has a place in the study of environment in the patterns of components that are relevant for the problem under consideration. An example is the study of female life careers, reported by Gustafson and Magnusson (1991) from the IDA program, in which the females' home background was described using patterns of relevant factors: father's and mother's education, parents' income, parents' evaluation of the girl's capacity for higher education, and parents' evaluation of higher education. The patterning of these environmental components turned out to have significance for the future life career of the daughters.

MM2 has a particular role in the study of children's environments at times when the organism is particularly open to environmental influence during infancy and early puberty. Because the individual and his or her environment, at the highest level of generalization, function as an inseparable system, the appropriate theoretical and empirical analysis should include analyses about patterns of person and environmental components, assessed simultaneously. For instance, Cairns et al. (1989) included both individual variables (e.g., cognition, aggression) and environmental variables (e.g., socioeconomic status) in constructing developmental patterns related to early school dropout. The application of MM2 is also of particular interest in the newly established area of positive development.

Comments

The relation between both MMs is orthogonal; there is no contradiction between them. Both are useful tools in developmental research, depending on the specific purpose.

The measurement task is distinctly different in the two approaches. In MM1, the task is to locate individuals on the latent dimension(s), and the appropriate measurement technique is the one that discriminates along the whole range of possible individual positions. In MM2, the task is to assign individuals (or environments and PE systems) to categories at the appropriate level, and the measurement problem is to maximize cutting scores on the borders of each category or class.

Statistics

A consequence of the formulation of theoretical models for complex, dynamic processes in natural sciences has been the development of statistical methods for the study of such processes. One line is the revival of nonlinear mathematics and methods for the study of patterns. For further scientific progress in research on individual development, it is important to take advantage of this development. If adequately applied, the new methodologies have important implications for theory building and empirical research on the dynamic, complex processes of individual development. An overview and discussion of

statistical tools in a person approach was presented by Bergman et al. (2003). There is a growing interest in and application of models and methods in this direction in developmental research (e.g., Bergman & El-Khouri, 1999, 2001; Molenaar, Boomsma, & Dolan, 1991; Nagin & Tremblay, 2001; Nesselroade & Molenaar, 2003; Nesselroade & Schmidt McCollam, 2000; Vallacher & Nowak, 1994; Valsiner, Chapter 4, this *Handbook,* this volume; van Geert, 1998; von Eye & Bergman, 2003). This development is of interest for two reasons: it has demonstrated the implications for empirical research of a holistic view of integrated, holistic processes, and it has stimulated the development of methodological tools (see, e.g., Lewis, 2000). At the same time, modern models for dynamic, complex processes, for example chaos theory, must be applied with caution. In contrast to the conditions under which chaos theory was originally found to be a valuable tool, an important working factor in individual current functioning, and accordingly also in developmental processes, is the individual's intentional active role—consciously and subconsciously—in the PE system.

RESEARCH STRATEGY

The foregoing sections have outlined a number of implications for successful research strategies in psychological research in general and in developmental research in particular. Instead of repeating them, attention is drawn to a few consequences, which ensure naturally from the perspective developed in this chapter.

A Multivariate Approach

When our concern is the functioning and development of a system—at the subsystem level, at the level of the total person, at the group level, or at the level of the PE system—the emphasis on multiple causation and the interdependency of operating factors at each level has as the consequence that the analysis should include a broad range of components, which have been identified as essential for the understanding of the processes at the appropriate level. This follows from the definition of a developmental science.

A Longitudinal Design

Two interrelated elements form the basis for the conclusion that longitudinal research on individual development is essential for understanding and explaining mechanisms in developmental processes over the life span: (1) the basic principles of transformation (with emergence and novelty), interaction, temporality, organization, and synchronization, and (2) the uniqueness of how these principles characterize individual developmental processes. Inherent in the nature of developmental processes is the requirement that they be studied in a temporal perspective (e.g., Sameroff & MacKenzie, 2003). Longitudinal research enables the researcher to study mechanisms in the developmental processes in a way that is not possible in cross-sectional research. The fundamental basis for this proposition is that it is not single variables but the integrated individual that develops and is identifiable over time (Magnusson, 1993). If a historian tried to understand the historical process behind the outbreak of World War II by drawing a sample of newspapers from different European countries on a certain day in June 1939, transforming the news into data and performing a multidimensional analysis of the data matrix, no one would take him seriously. But isn't that what we do by using cross-sectional group data as a basis for conclusions about developmental processes?

The only way to understand processes is to follow them over time. The period for following the individual varies with the process that is being investigated. A study on brain development during the first weeks of life and infancy requires frequent observation for a limited time. Frequent observations during shorter periods of time may also yield deeper understanding of factors associated with changes in motivation, adjustment and performance in the transition from day care to school, during the very 1st year of school, or in the transition from school to work as demonstrated by Nurmi and his coworkers (see, e.g., Nurmi, Salmela-Aro, & Koivisto, 2002).The same may be the appropriate approach during other periods of rapid, dramatic change, for example, during the beginning of menopausal changes or some aspects of aging (see, e.g., Nilsson et al., 2004). Understanding these processes requires frequent observations of individuals for a relatively limited period of time. A manageable way to handle this time-consuming procedure could be to make the observations on a small sample of individuals in close collaboration with each of them or their caretakers. An investigation of the individual implications of pubertal development for the further life course necessarily needs a period of observation that extends across adolescence until adult life. As empha-

sized before, totally wrong and clinically disastrous implications can follow from unduly brief observation of pubertal development. This was unambiguously demonstrated in the Stockholm IDA program. For further analyses and discussions about the role of biological maturation in developmental processes, it is of interest to note that when the females in the IDA program participated at the age of 43, no significant relations were found between physical and mental health at that age and menarche age (El-Khouri & Mellner, 2004).

Longitudinal research has a long tradition. The arguments for this approach were formulated forcefully by many developmental researchers (e.g., McCall, 1977), and the merits and pitfalls were also carefully analyzed (e.g., Baltes, Cornelius, & Nesselroade, 1979; Schaie & Baltes, 1975). For various reasons, it took a long time for the merits of longitudinal research to be sufficiently appreciated so that strong research programs were launched. In recent decades, however, there has been a growing awareness of the necessity to conduct such research. A manifestation of this trend is that the first scientific network established by the European Science Foundation in the mid 1980s was the European Network on Longitudinal Research on Individual Development.[8]

An inventory, administered by Schneider and Edelstein (1990) in the framework of the network, identified about 500 ongoing longitudinal research projects in Europe concerned with psychosocial and psychobiological development. Recently, an overview of longitudinal research programs in the United States was presented by Phelps, Furstenberg, and Colby (2002).

Comment

Individual development, in its most general form, can be defined as any progressive or regressive change in size, shape, and/or function. This definition has two interrelated consequences. First, what constitutes longitudinal is not only time but whether changes occur in the structures or process(es) being studied. Second, the appropriate method for systematic observation of change—laboratory experiments, natural experiments, systematic, descriptive analyses of phenomena over longer periods of time, narrative reports, and so on—varies with the nature of the process(es) being studied and the conditions under which observations can be made.

Cultural and Cross-Cultural Research

We have drawn attention earlier to the extreme ethnocentric view that is reflected in planning, implementing, and interpreting psychological research, including developmental research, in Western countries (see, e.g., Graham, 1992). Both in theory and practice, the Western human being is often regarded as the norm and the behavior of human beings from other cultures as deviant. This is expressed in many ways. One implication of the view on individual functioning and development as dependent on and related to the nature and functioning of the environment is the need for systematic cultural and cross-cultural research. The role of the environment is not restricted to stimuli and events in the immediate situation. As we have argued, each specific event is embedded in social and cultural systems at different levels and is interpreted by the individual in the specific framework of these systems. Results of studies of differences in the developmental processes among children being raised in different cultures contribute essential knowledge, both with respect to the factors operating in the individual and in the environment, and with respect to the mechanisms by which these factors operate. The enormous importance of cultural research for our generalizations about "human nature" was demonstrated in the research reported by Luria (1976) on illiterate and isolated humans. Today, further information has accumulated about the variation in parenting in different cultures (Harkness & Super, 2002).

Multidisciplinary Collaboration

Understanding and explaining individual functioning and development presupposes knowledge of the role of psychobiological components of the individual and of environmental factors involved in the PE system. As argued in the earlier discussion of developmental science, this implies the need of knowledge from research at the interface of a number of neighboring disciplines. Shanahan, Valsiner, and Gottlieb (1997) presented an interesting analysis of developmental concepts across

[8] In a series of workshops, topics of central interest for understanding and explaining individual development were discussed and presented in eight volumes (Baltes & Baltes, 1990; de Ribaupierre, 1989; Kalverboer, Hopkins, & Geuze, 1993; Magnusson & Bergman, 1990; Magnusson, Bergman, Rudinger, & Törestad, 1991; Magnusson & Casaer, 1993; Rutter, 1988; Rutter & Casaer, 1991).

disciplines. Such knowledge comes as the result of collaboration between researchers in the traditional field of psychology, and also between researchers from psychology and those from other disciplines concerned. A prerequisite for such collaboration and for real scientific progress is the formulation of and reference to a general, common model of the individual and society. Systematic, well-planned collaboration in the field of developmental science with reference to such a common model has strong potentialities. In an editorial in Science, Leshner (2004) concluded, among other things, after the American Association for the Advancement of Science (AAAS) annual conference on Science at the Leading Edge: "We are learning another important lesson: that no field stands alone. Progress in any one domain is absolutely dependent on progress in many other disciplines" (p. 429). This conclusion is equally valid for research on individual developmental processes.

Prevention, Treatment, and Intervention

Research on the mental and sociocultural structures and processes operating in individual life courses constitutes a central scientific concern in its own right. However, the societal implications are also important, in as much as knowledge about the positive and negative aspects of human development can be used to promote healthy and prevent harmful development. The holistic-interactionistic model has important implications for the knowledge that is needed for effective intervention and treatment in societal policy, manifested in the formation of agencies, programs and other initiatives.

Empirical studies indicate that the existence of single individual problems and/or single problems in the social environment during childhood and adolescence have only a limited negative influence on the future adjustment of individuals. An increased risk for later maladjustment problems appears in individuals for whom problem behaviors accumulate during late childhood and adolescence and/or in social settings characterized by a broad range of risk factors (e.g., L. N. Robins, 1966; Stattin & Klackenberg, 1992). Adjustment problems of different kinds tend to gravitate toward a limited number of individuals, and this group is responsible for a large portion of adjustment problems manifested in early drug and alcohol abuse, criminality, bullying, and so on (Stattin & Magnusson, 1996).

In spite of these well-known circumstances, discussions of and research on these types of problems are often focused on a certain variable (e.g., aggressiveness), or a certain problem (e.g., alcohol abuse), applying a specific perspective (e.g., a sociological, psychological, or criminological perspective). In this situation, intervention programs are often implemented in isolated environments, concentrated on a single problem, and focused on a special age group with reference to a single perspective. Often the prophylactic actions and treatment programs are temporary "projects," not anchored in an overriding, long-term strategy based on available scientific knowledge and experiences from a broad range of expertise among those involved in the applied field. Different actors and agencies are active in the same area, often in parallel but sometimes in competition; that is, without coordination and collaboration.

Empirical research indicates that negative aspects of the development process of individuals tend to go together. For example, Magnusson (1988) reported from the IDA program that 52% of those who were registered for criminal activities during the ages of 18 to 23 were also registered for alcohol abuse and/or psychiatric care. Of those who were registered for alcohol abuse, 77% were also registered for criminal activity and/or psychiatric care. The corresponding figure for those with psychiatric records was 58%. More than a matter of, for example, alcohol problems or violence, it is a matter of general lifestyles. The broader range of adjustment problems during adolescence cannot be isolated from the earlier development process and social context. The implications for societal organization of prevention and treatment of asocial and antisocial behaviors are obvious.

The holistic-interactionistic model for individual development implies that the total person-environment system must be considered, not single problems of individual functioning and single risk factors in the social context, in the organization and implementation of societal programs for intervention and treatment. Long-term programs and strategies must be worked out based on knowledge from all relevant fields of developmental science, and planned and implemented in close collaboration among professionals representing multiple agencies, programs, and initiatives, which must be integrated so that the breadth of the individual person-environment system is adequately engaged.

CONCLUSION

As a background to some conclusions, some of the conspicuous tendencies in theoretical and empirical research on individual functioning and development can be briefly summarized:

1. To the extent that empirical studies refer to theory, hypothesis testing is done with reference to piecemeal theories holding for the subarea(s) to which the issue under consideration belongs; there is a lack of reference to an integrated, overriding theoretical framework (e.g., Löfgren, 2004).
2. Problems are investigated and the results discussed in statistical terms as if statistical significance were synonymous with psychological significance. This often applies, for example, in discussions of causal models and causal relations. The tradition has been fostered by the development of sophisticated data analytic methods.
3. The study of personality and individual development is defined as the study of interindividual differences (e.g., Block, 2003). Results of studying individual differences at group level sometimes form the basis for conclusions about functioning at the individual level.
4. Theoretical and empirical research is very ethnocentric. It is often implicitly assumed that results of studies performed in Western cultures can be used as basis for conclusions about human nature.

Each of these approaches has its merits and has contributed essential knowledge in some subfields in which it is appropriately applied. Each of them also has its limitations, which become particularly clear when the purpose of studies is to contribute to understanding individual developmental processes. A number of prominent scientists have emphasized the hampering effect of the fragmentation of psychology on scientific progress, as reflected in the points summarized above (e.g., Sanford, 1965). Lately, Rom Harré (2000) gave the following evaluation in an article in *Science:*

> It has been about thirty years since the first rumblings of discontent with the state of academic psychology began to be heard. Then, as now, dissident voices were more audible in Europe than in the United States. It is a remarkable feature of mainstream academic psychology that, alone among the sciences, it should be almost wholly immune to critical appraisal as an enterprise. Methods that have long been shown to be ineffective or worse are still used on a routine basis by hundreds, perhaps thousands of people. Conceptual muddles long exposed to view are evident in almost every issue of standard psychological journals. This is a curious state of affairs. New pathways and more realistic paradigms of research have been proposed, demonstrated, and ignored. . . . The natural sciences have achieved their enormous success by the adoption of schemata through which the indeterminate world around us can be made to disclose some of its features. (p. 1303)

We have noted in several connections here promising trends toward integration of subareas, for example, at the interface of cognition and brain research, brain research and emotions, self-consciousness and emotions, and so on. Further scientific progress in research on individual development, in line with what happens in other life sciences, requires that the full consequences of integration in the framework of a general model of the person in the environment are accepted and applied.

We have analyzed and discussed individual development as an integrated, dynamic, complex process going on in the framework of an integrated PE system and have pointed to precise and important implications for empirical research. The holistic-interactionistic model has formed the general theoretical framework for the discussion of the functioning and development of the individual in that setting and for the identification of basic principles in developmental processes.

As we have emphasized earlier, the holistic-interactionistic model is not another vague concept that sometimes appears in discussions of psychological issues and occasionally becomes popular. The scientific application of the modern holistic-interactionistic model requires consideration of the basic principles of which the most conspicuous have been discussed here: the holistic principle, transformation, interaction, temporality, organization, synthesis, and—a most central principle—individuality.

The proposition that the holistic-interactionistic model and the ensuring basic principles can serve as the general theoretical framework for empirical research on developmental processes needs two comments:

1. The formulations of the model and its consequences have to be seen as open for modification, based on further experiences gained from its application. Evolutionary theory is not the same today as it was 150 years ago; it has been modified by reformulations

and extensions (Goodwin, 1994). This is an example of the normal development of science.

2. The adoption of a holistic-interactionistic general frame of reference for the study of specific phenomena is in line with general trend in scientific disciplines concerned with dynamic, complex processes, including life sciences. The claim for a common theoretical framework for the study of individual development is part of a broader scientific zeitgeist. A growing understanding of the need for a general model of the individual as an active, intentional part of his or her PE system is expressed (e.g., Li, 2003).

A holistic-interactionistic general frame of reference for the design, implementation and interpretation of empirical studies on specific developmental issues does not mean that everything achieved hitherto has been wrong and without important results. The holistic-interactionistic model is not a substitute for, but includes and is a complement to, the existing approaches as an example of the progress of normal science. To make real progress in future theorizing and empirical research, the challenging task is to see the theoretical, methodological, and research strategy implications and take them seriously.

Mayr (1997) in his analysis of the history of biology concluded that the remarkable success during the twentieth century could not have been achieved if biology had not left the paradigm of physics and developed its own theoretical ground or a methodology that fits the nature of the biological processes. We need an overriding theoretical framework as a prerequisite for building the synthesis of knowledge about why individuals think, feel, act, and react as they do in real life and how they develop in these respects. Our goal in this chapter has been to summarize the motives for a holistic-interactionistic model to play that role. However we choose to designate it, the time has come for a general model. We need it in the formulation of the problems to be investigated, in the choice of appropriate data and measurement models, and in the interpretation of the results, it we want to keep up with progress in other life sciences.

The Mind: Worldviews and Self-Perceptions

The building blocks of all societies and cultures are individuals. To use a metaphor, individuals are the cells of a society. In that role the individual is an active, intentional participant in a dynamic, complex interaction process with the environment. This perspective leads to some comments.

The integrated mind, involving perceptions, cognitions, self-perceptions, emotions, and values, forms the mental frame of reference for an individual's conscious and subconscious sense of meaning in observations of the external world and of her or his own role. Thus, the mental life of an individual plays the decisive role for that individual's inner life, relations to other people, interpreting what happens, expectations about what might happen in the proximal and distal environments, and the goals and directions of internal and external activities.

At each stage, the way individual mental life is structured and functions is dependent on the individual's interaction with the environment during earlier life phases. A consequence is that no two individuals have the same worldview and self-perceptions. The integrated common environmental frame of reference for attitudes, beliefs, and behaviors, dominating the proximal and distal environment of an individual, plays a central role in the development of his/her worldview.

For many individuals on the globe, religious beliefs with political consequences dominate and guide mental processes and manifest activities to an extent that is often forgotten in scientific psychology. Religious and political beliefs that are shared by all members of a proximal group, a society, or a culture form not only a strong basis for unity, solidarity, and harmony but also cause conflicts with individuals, groups, and cultures with other beliefs. Armstrong (2000) presented an illustrative historical overview of this in her book *The Battle for God.*

Religious beliefs and other aspects of worldviews have an enormously strong role in history as well as in the present world. For most people, world views organize their lives and their use of resources for participation in personal, religious, social, cultural, and political activities. The roots of both solidarity and conflicts at all levels, from individuals to societies, are in the minds of the people and their religious and political leaders. With respect to these circumstances, understanding the functioning of the integrated minds of individuals should be one of the most central tasks for scientific psychology. We must recognize that science can never answer existential questions, such as what is the meaning of life, or present a final solution to the question of which belief has the strongest scientific ground. What we can do, to the benefit of all societies in the long run,

is to contribute to a synthesis of knowledge about the role and consequences of worldviews for individuals, groups, and societies. This task implies, among other things, a challenge for basic research about the individual in the environment from the perspective proposed in this chapter. To meet that challenge with solid scientific work, we need a general model of the individual and society.

REFERENCES

Ainsworth, M. D. S. (1983). Patterns of infant-mother attachment as related to maternal care: Their early history and their contribution to continuity. In D. Magnusson & V. L. Allen (Eds.), *Human development: An interactional perspective* (pp. 35–53). New York: Academic Press.

Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and prediction in social behavior.* Englewood Cliffs, NJ: Prentice-Hall.

Allport, G. W. (1924). The study of the undivided personality. *Journal of Abnormal and Social Psychology, 19,* 131–141.

Allport, G. W. (1937). *Personality: A psychological interpretation.* New York: Holt, Rinehart and Winston.

Allport, G. W. (1961). *Pattern and growth in personality.* New York: Holt, Rinehart and Wilson.

Alm, P. O., Alm, M., Humble, K., Leppert, J., Sorensen, S., Lidberg, L., et al. (1994). Criminality and platelet monoamine oxidase activity in former juvenile delinquents as adults. *Acta Psychiatrica Scandinavica, 89,* 41–45.

Alsaker, F. D. (1995). *Timing of puberty and reactions to pubertal changes.* Unpublished manuscript, University of Berne, Switzerland.

Anastasi, A. (1958). Heredity, environment and the question "how"? *Psychological Review, 65,* 197–208.

Andersson, T., Bergman, L. R., & Magnusson, D. (1989). Patterns of adjustment problems and alcohol abuse in early childhood: A prospective longitudinal study. *Development and Psychopathology, 1,* 119–131.

Angell, J. R. (1907). The province of functional psychology. *Psychological Review, 65,* 197–208.

Angell, J. R., & Thompson, H. B. (1899). A study of the relations between certain organic processes and consciousness. *Psychological Review, 6,* 32–46.

Angoff, W. H. (1988). The nature-nurture debate, aptitudes, and group differences. *American Psychologist, 43,* 713–720.

Appley, M. H., & Turnball, R. (1986). *Dynamics of stress: Physiological, psychological, and social perspectives.* New York: Plenum Press.

Armstrong, K. (2000). *The battle for God.* New York: Ballantine Book.

Aspinwall, L., & Staudinger, U. M. (Eds.). (2003). *A psychology of human strengths: Perspectives on an emerging field.* Washington, DC: American Psychological Association.

Baltes, P. B. (1976). Symposium on implications of life-span developmental psychology for child development. *Advances in Child Development and Behavior, 11,* 167–265.

Baltes, P. B. (1979). Life-span developmental psychology: Some converging observations on history and theory. In P. B. Baltes & O. G. Brim Jr. (Eds.), *Life-span development and behavior* (Vol. 2, pp. 255–279). New York: Academic Press.

Baltes, P. B. (1987). Theoretical propositions of life-span developmental psychology: On the dynamics between growth and decline. *Developmental Psychology, 23,* 611–626.

Baltes, P. B., & Baltes, M. (1990). *Successful aging: Perspectives from the behavioral sciences.* Cambridge, England: Cambridge University Press.

Baltes, P. B., Cornelius, S. W., & Nesselroade, J. R. (1979). Cohort effects in developmental psychology. In J. R. Nesselroade & P. B. Baltes (Eds.), *Longitudinal research in the study of behavior and development* (pp. 61–87). New York: Academic Press.

Baltes, P. B., & Graf, P. (1996). Psychological aspects of aging: Facts and frontiers. In D. Magnusson (Ed.), *The life-span development of individuals: Behavioral, neurobiological and psychosocial perspectives* (pp. 426–460). Cambridge, England: Cambridge University Press.

Baltes, P. B., Lindenberger, U., & Staudinger, U. M. (1998). Life-span theory in developmental psychology. In W. Damon (Editor-in-Chief) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (pp. 1029–1143). New York: Wiley.

Baltes, P. B., Reese, H. W., & Nesselroade, J. R. (1988). *Life-span developmental psychology: Introduction to research methods.* Hillsdale, NJ: Erlbaum.

Baltes, P. B., & Smith, J. (2004). Lifespan psychology: From developmental contextualism to developmental biocultural co-constructivism. *Research in Human Development, 1*(3), 123–144.

Baltes, P. B., & Staudinger, U. M. (1996a). Interactive minds in a life-span perspective: Prologue. In P. B. Baltes & U. M. Staudinger (Eds.), *Interactive minds: Life-span perspectives on the social foundation of cognition* (pp. 1–32). New York: Cambridge University Press.

Baltes, P. B., & Staudinger, U. M. (1996b). *Interactive minds: Life-span perspectives on the social foundation of cognition.* New York: Cambridge University Press.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavior change. *Psychological Review, 84,* 191–215.

Bandura, A. (1982). The psychology of chance encounters and life paths. *American Psychologist, 37,* 747–755.

Bandura, A. (1997). *Self-efficacy: The exercise of control.* New York: Freeman.

Barker, R. G. (1965). Exploration in ecological psychology. *American Psychologist, 20,* 1–14.

Barton, S. (1994). Chaos, self-organization, and psychology. *American Psychologist, 49,* 5–14.

Bateson, P. P. G. (1996). Design for a life. In D. Magnusson (Ed.), *The life-span development of individuals: Behavioral, neurobiological and psychosocial perspectives* (pp. 1–20). Cambridge, England: Cambridge University Press.

Baumrind, D. (1971). Types of adolescents life-styles. *Developmental Psychology, Monograph 4.*

Baumrind, D. (1989). Rearing competent children. In W. Damon (Ed.), *Child development today and tomorrow* (pp. 349–378). San Francisco: Jossey-Bass.

Belfrage, H., Lidberg, L., & Oreland, L. (1992). Platelet monoamine-oxidase activity in mentally disordered violent offenders. *Acta Psychiatrica Scandinavica, 85,* 218–221.

Bell, R. Q. (1968). Reinterpretation of the direction of effects in studies of socialization. *Psychological Review, 75,* 81–95.

Bell, R. Q. (1971). Stimulus control of parent or caretaker by offspring. *Developmental Psychology, 4,* 63–72.

Belsky, J. (1981). Early human experience: A family perspective. *Developmental Psychology, 17,* 3–23.

Bergman, L. R. (1988a). Modeling reality: Some comments. In M. Rutter (Ed.), *Studies of psychosocial risk: The power of longitudinal data* (pp. 354–366). Cambridge, England: Cambridge University Press.

Bergman, L. R. (1988b). You can't classify all of the people all of the time. *Multivariate Behavioral Research, 23,* 425–441.

Bergman, L. R. (1998). A pattern-oriented approach to studying individual development: Snapshots and processes. In R. B. Cairns, L. R. Bergman, & J. Kagan (Eds.), *Methods and models for studying the individual* (pp. 83–121). Thousand Oaks, CA: Sage.

Bergman, L. R. (2002). Studying processes: Some methodological considerations. In L. R. Bergman & A. Caspi (Eds.), *Paths to successful development: Personality in the life course* (pp. 177–198). Cambridge, England: Cambridge University Press.

Bergman, L. R., & El-Khouri, B. M. (1999). Studying individual patterns of development using I-States as Objects Analysis (ISOA). *Biometrical Journal, 41,* 753–770.

Bergman, L. R., & El-Khouri, B. M. (2001). Developmental processes and the modern typological perspective. *European Psychologist, 6,* 177–186.

Bergman, L. R., & Magnusson, D. (1990). General issues about data quality in longitudinal research. In D. Magnusson & L. R. Bergman (Eds.), *Data quality in longitudinal research* (pp. 1–31). Cambridge, England: Cambridge University Press.

Bergman, L. R., & Magnusson, D. (1991). Stability and change in patterns of extrinsic adjustment problems. In D. Magnusson, L. R. Bergman, G. Rudinger, & B. Törestad (Eds.), *Problems and methods in longitudinal research: Stability and change* (pp. 323–346). Cambridge, England: Cambridge University Press.

Bergman, L. R., & Magnusson, D. (1997). A person-oriented approach in research on psychopathology. *Development and Psychopathology, 9,* 291–319.

Bergman, L. R., Magnusson, D., & El-Khouri, B. M. (2003). Studying individual development in an interindividual context: A person-oriented approach. In D. Magnusson (Series Ed.), *Paths through life* (Vol. 4). Mahwah, NJ: Erlbaum.

Berndt, T. J. (1982). The features and effects of friendships in early adolescence. *Child Development, 53,* 1447–1460.

Bishop, Y. M. M., Feinberg, S. E., & Holland, P. W. (1975). *Discrete multivariate analysis: Theory and practice.* Cambridge, MA: MIT Press.

Block, J. (1971). *Lives through time.* Berkeley, CA: Bancroft Books.

Block, J. (2003). My unexpected life. *Journal of Personality Assessment, 81,* 194–208.

Blumberg, H. P., Kaufman, J., Martin, A., Whiteman, R., Zhang, J. H., Gore, J. C., et al. (2003). Amygdala and hippocampal volumes in adolescents and adults with bipolar disorder. *Archives of General Psychiatry, 60,* 1201–1208.

Bock, H. H. (1987). *Classification and related methods of data analysis.* Amsterdam: North-Holland.

Bohman, M., Cloninger, C. R., Sigvardsson, S., & von Knorring, A.-L. (1982). Predispositions to petty criminality in Swedish adoptees. *Archives of General Psychiatry, 39,* 1233–1241.

Bolles, C. (1972). Reinforcement, expectancy and learning. *Psychological Review, 79,* 394–409.

Boncinelli, E. (2001). Brain and mind. *European Review, 9,* 389–396.

Borkenau, P., & Ostendorf, F. (1998). The big five as states: How useful is the five-factor model to describe intraindividual variations over time? *Journal of Research in Personality, 32,* 202–221.

Borsboom, D., Mellenbergh, G. J., & van Heerden, J. (2003). The theoretical status of latent variables. *Psychological Review, 10*(2), 203–219.

Bowlby, J. (1952). *Maternal care and mental health* (2nd ed.). Geneva, Switzerland: World Health Organization.

Brandtstädter, J. (1993). Development, aging and control: Empirical and theoretical issues. In D. Magnusson & P. Casaer (Eds.), *Longitudinal research on individual development: Present status and future perspectives* (pp. 194–216). Cambridge, England: Cambridge University Press.

Brentano, E. (1924). *Psychologie vom empirischen Standpunkte* [Psychology from an empirical point of view]. Leipzig, Germany: F. Meiner. (Original work published 1874)

Broberg, G. (1978). *Carl von Linné: Om jämvikten i naturen* [About balance in nature]. Stockholm: Carmina.

Bronfenbrenner, U. (1943). A constant frame of reference for sociometric research. *Sociometry, 6,* 363–397.

Bronfenbrenner, U. (1989). Ecological systems theory. *Annals of Child Development, 6,* 185–246.

Bronfenbrenner, U., & Ceci, S. J. (1994). Nature-nurture reconceptualized in a developmental perspective: A bio-ecological perspective. *Psychological Review, 101,* 568–586.

Bronfenbrenner, U., & Crouter, A. C. (1983). The evolution of environmental models in developmental research. In P. Mussen (Series Ed.) & W. Kessen (Vol. Ed.), *Handbook of child psychology: Vol. 1. History, theories and methods* (4th ed., pp. 357–414). New York: Wiley.

Bronfenbrenner, U., & Morris, P. A. (1998). The ecology of developmental processes. In W. Damon (Editor-in-Chief) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 993–1028). New York: Wiley.

Brooks-Gunn, J., & Paikoff, R. L. (1992). Changes in self-feelings during the transition towards adolescence. In H. McGurk (Ed.), *Childhood social development: Comtemporary perspectives* (pp. 63–97). Hillsdale, NJ: Erlbaum.

Brooks-Gunn, J., & Petersen, A. C. (1983). *Girls at puberty: Biological and psychosocial perspectives.* New York: Plenum Press.

Brown, G. W., Harris, T. O., & Peto, J. (1973). Life-events and psychiatric disorder: Vol. 2. Nature of causal link. *Psychological Medicine, 3,* 159–176.

Brunswik, E. (1952). *The conceptual framework of psychology.* Chicago: University of Chicago Press.

Buck, L., & Axel, R. (1991). A novel multigene family may encode odorant receptors: A molecular basis for odor recognition. *Cell, 65,* 175–187.

Buikhuisen, W. (1982). Aggressive behavior and cognitive disorders. *International Journal of Law and Psychiatry, 5,* 205–217.

Buikhuisen, W. (1987). Cerebral dysfunctions and juvenile crime. In S. A. Mednick, T. E. Moffitt, & S. A. Stack (Eds.), *The causes of crime: New biological approaches* (pp. 168–184). Cambridge, England: Cambridge University Press.

Cairns, R. B. (1979). *Social development: The origins and plasticity of interchanges.* San Francisco: Freeman.

Cairns, R. B. (1986a). A contemporary perspective on social development. In P. S. Strain, M. J. Guralnick, & H. M. Walker (Eds.), *Children's social behavior: Development, assessment, and modification* (pp. 3–47). New York: Academic Press.

Cairns, R. B. (1986b). Phenomena lost: Issues in the study of development. In J. Valsiner (Ed.), *The individual subject and scientific psychology* (pp. 79–112). New York: Plenum Press.

Cairns, R. B. (1996). Socialization and sociogenesis. In D. Magnusson (Ed.), *The life-span development of individuals: Behavioral, neurobiological and psychosocial perspectives* (pp. 277–295). New York: Cambridge University Press.

Cairns, R. B. (1998). The making of developmental psychology. In W. Damon (Editor-in-Chief) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 25–105). New York: Wiley.

Cairns, R. B. (2000). Developmental science: Three audacious implications. In L. R. Bergman, R. B. Cairns, L.-G. Nilsson, & L. Nystedt (Eds.), *Developmental science and the holistic approach* (pp. 49–62). Mahwah, NJ: Erlbaum.

Cairns, R. B., & Cairns, B. D. (1985). The developmental-interactional view of social behavior: Four issues of adolescent aggression. In D. Olweus, J. Block, & M. Radke-Yarrow (Eds.), *The development of antisocial and prosocial behavior.* New York: Academic Press.

Cairns, R. B., & Cairns, B. D. (1994). *Lifelines and risks: Pathways of youth in our time.* Cambridge, England: Cambridge University Press.

Cairns, R. B., Cairns, B. D., Neckerman, H. J., Fergusson, L. L., & Gariépy, J.-L. (1989). Growth and aggression: Vol. I. Childhood to early adolescence. *Developmental Psychology, 25,* 320–330.

Cairns, R. B., & Hood, K. E. (1983). Continuity in social development: A comparative perspective on individual difference prediction. In P. B. Baltes & O. G. Brim Jr. (Eds.), *Life-span development and behavior* (pp. 302–358). New York: Academic Press.

Cairns, R. B., & Rodkin, P. C. (1998). Phenomena regained: From configurations to pathways. In R. B. Cairns, L. R. Bergman, & J. Kagan (Eds.), *Methods and models for studying the individual* (pp. 245–264). Thousand Oaks: Sage.

Cannon, W. B. (1914). The emergency function of the adrenal medulla in pain and the major emotions. *American Journal of Physiology, 33,* 356–372.

Caprara, G. V., & Zimbardo, P. G. (1996). Aggregation and amplification of marginal deviations in the social construction of personality and maladjustment. *European Journal of Personality, 10,* 79–110.

Carlson, M., Earls, F., & Todd, R. D. (1988). The importance of regressive changes in the development of the nervous system: Towards a neurobiological theory of child development. *Psychiatric Developments, 1,* 1–22.

Carlson, R. (1988). Exemplary lives: The uses of psychobiography for theory development. *Journal of Personality, 56,* 105–138.

Carver, C. S., & Scheier, M. F. (1998). *On the self-regulation of behavior.* Cambridge, MA: Cambridge University Press.

Caspi, A. (1987). Personality in the life course. *Journal of Personality and Social Psychology, 53,* 1203–1213.

Caspi, A. (1995). Puberty and the gender organization of schools: How biology and social context shape the adolescent experience. In L. J. Crockett & A. C. Crouter (Eds.), *Pathways through adolescence: Individual development in relation to social contexts* (Penn State series on child and adolescent development, pp. 57–74). Hillsdale, NJ: Erlbaum.

Caspi, A., Lynam, D., Moffitt, T., & Silva, P. A. (1993). Unraveling girls' delinquency: Biological, dispositional, and contextual contributions to adolescent behavior. *Developmental Psychology, 29,* 19–30.

Caspi, A., & Moffitt, T. (1991). Individual differences are accentuated during periods of social change: The sample case of girls at puberty. *Journal of Personality and Social Psychology, 61,* 157–168.

Cattell, R. B., Cattell, A. K. S., & Rhymer, R. M. (1947). P-technique demonstrated in determining psycho-physiological source traits in a normal individual. *Psychometrika, 12,* 267–288.

Cervone, D. (2004). Personality architecture: Within-person structures and processes. *Annual Review of Psychology, 56,* 423–452.

Coie, J. D., Dodge, K. A., & Coppotelli, H. (1982). Dimensions and types of social status: A cross-age perspective. *Developmental Psychology, 18,* 557–570.

Coie, J. D., & Kupersmidt, J. B. (1983). A behavioral analysis of emerging social status in boy's groups. *Child Development, 54,* 1400–1416.

Coleman, J. S. (1990). *Foundations of social theory.* Cambridge, MA: Belknap Press.

Collins, L. M., & Wugalter, S. E. (1992). Latent class models for stage-sequential dynamic latent variables. *Multivariable Behavioral Research, 27,* 131–157.

Costanzo, P. R. (1991). Morals, mothers, and memories: The social context of developing social cognition. In R. Cohen & A. W. Siegel (Eds.), *Context and development* (pp. 91–134). Hillsdale, NJ: Erlbaum.

Cowen, E. L., Pederson, A., Babigian, H., Izzo, L. D., & Trost, M. A. (1973). Long-term follow-up of early detected vulnerable children. *Journal of Consulting and Clinical Psychology, 41,* 438–446.

Crick, F. (1988). *What mad pursuit: A personal view of scientific discovery.* New York: Basic Books.

Cronbach, L. J. (1954). The two disciplines of scientific psychology. *American Psychologist, 12,* 671–684.

Cronbach, L. J. (1975). Beyond the two disciplines of scientific psychology. *American Psychologist, 30,* 116–127.

Cronbach, L. J., & Gleser, G. C. (1953). Assessing similarities between profiles. *Psychological Bulletin, 50,* 456–473.

Csikszentmihalyi, M. (1993). Contexts in optimal growth in childhood. *Daedalus,* 31–56.

Damasio, A. (1999). *The feeling of what happens: Body and emotion in the making of consciousness.* New York: Harcourt Brace.

Damasio, A. (2003). *Looking for Spinoza: Joy, sorrow, and the feeling brain.* Orlando, FL: Hartcourt.

Damasio, A. R., & Damasio, H. (1996). Advances in cognitive neuroscience. In D. Magnusson (Ed.), *The life-span development of individuals: Behavioral, neurobiological and psychosocial perspectives* (pp. 265–273). Cambridge, England: Cambridge University Press.

Darlington, R. B. (1968). Multiple regression in psychological research and practice. *Psychological Bulletin, 69,* 161–182.

Darwin, C. (1859). *On the origin of species by means of natural selection or the preservations of favored races in the struggle for life.* London: John Murray.

Darwin, C. (1872). *The expressions of emotions in man and animals.* London: John Murray.

Dawson, G., Ashman, S. B., & Carver, L. J. (2000). The role of early experience in shaping behavioral and brain development and its implications for social policy. *Development and Psychopathology, 12,* 695–712.

de Ribaupierre, A. (1989). *Transition mechanisms in child development: The longitudinal perspective*. Cambridge, England: Cambridge University Press.

Dick, D. M., Rose, R. J., Viken, R. J., & Kaprio, J. (2000). Pubertal timing and substance use: Associations between and within families across late adolescence. *Developmental Psychology, 36,* 180–189.

Dishion, T. J., McCord, J., & Poulin, F. (1999). When interventions harm: Peer groups and problem behavior. *American Psychologist, 54,* 755–769.

Dixon, R. A., & Lerner, R. M. (1988). A history of systems in developmental psychology. In M. H. Bornstein & M. E. Lamb (Eds.), *Developmental psychology: An advanced textbook* (2nd ed., pp. 3–50). Hillsdale, NJ: Erlbaum.

Dodge, K. A. (1990). Nature versus nurture in childhood conduct disorder: It is time to ask a different question. *Developmental Psychology, 26,* 698–701.

Dowdney, L., & Pickles, A. R. (1991). Expression of negative affect within disciplinary encounters: Is there dyadic reciprocity? *Developmental Psychology, 27,* 606–617.

Dunn, J., & Plomin, R. (1990). *Separate lives: Why siblings are so different*. New York: Basic Books.

Earls, F., & Carlson, M. (1995). Promoting human capability as alternative to early crime prevention. In R. V. Clarke, J. McCord, & P. O. Wikstrom (Eds.), *Integrating crime prevention strategies: Propensity and opportunity* (pp. 141–168). Stockholm, Sweden: National Council for Crime Prevention.

Eccles, J. S., Midgley, C., Wigfield, A., Buchanan, C. M., Reuman, D., Flanagan, C., et al. (1993). The impact of stage-environment fit in young adolescents' experiences in schools and families. *American Psychologist, 48,* 90–101.

Eccles, J. S., & Robinson, D. (1985). *The wonder of being human: Our brain and our mind*. Boston: New Science Library.

Eccles, J. S., & Wigfield, A. (2002). Motivational beliefs, values, and goals. *Annual Review of Psychology, 53,* 109–132.

Edelman, G. (1987). *Neural Darwinism: The theory of neuronal group selection*. New York: Basic Books.

Edelman, G. E. (1989). Topobiology. *Scientific American, 260,* 44–52.

Efklides, A. (2005). Motivation and affect in the self-regulation of behavior. *European Psychologist, 10*(3), 173–174.

Elder, G. H., Jr. (1996). Human lives in changing societies: Life course and developmental insights. In R. B. Cairns, G. H. Elder Jr., & E. J. Costello (Eds.), *Developmental Science* (pp. 31–62). New York: Cambridge University Press.

Elder, G. H., Jr. (1998). The life course and human development. In W. Damon (Editor-in-Chief) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 939–991). New York: Wiley.

Elder, G. H., Jr., Van Nguyen, T., & Caspi, A. (1985). Linking family hardship to children's lives. *Child Development, 56,* 361–375.

El-Khouri, B. M., & Mellner, C. (2004). Symptom development and timing of menarche: A longitudinal study. *International Journal of Methods in Psychiatric Research, 13,* 40–53.

Emde, R. N. (1994). Individuality, and the search for meaning. *Child Development, 65,* 719–737.

Emler, N., & McNamara, S. (1996, May). *Social structures and interpersonal relationships*. Paper presented at the 5th biennial conference of the European Association for Research on Adolescence, Liège.

Endler, N. S., & Magnusson, D. (1976). Towards an interactional psychology of personality. *Psychological Bulletin, 83,* 956–979.

Epstein, S. (1990). Cognitive-experiential self-theory. In L. A. Pervin (Ed.), *Handbook of personality: Theory and research* (pp. 165–192). New York: Guilford Press.

Ericsson, K. A., Krampe, R. T., & Tesch-Römer, C. (1993). The role of deliberate practice in the acquisition of expert performance. *Psychological Review, 100,* 363–406.

Eysenck, H. J. (1990). Biological dimensions of personality. In L. Pervin (Ed.), *Handbook of personality: Theory and research* (pp. 244–276). New York: Guilford Press.

Faulconer, J. E., & Williams, R. N. (1985). Temporality in human action: An alternative to positivism and historicism. *American Journal of Psychology, 40,* 1179–1188.

Fensham, P., & Marton, F. (1991). *High-school teachers' and university chemists' differing conceptualization of the personal activity in constituting knowledge in chemistry*. Gothenburg, Sweden: University of Gothenburg, 1, Department of Education and Educational Research.

Fentress, J. C. (1989). Developmental roots of behavioral order: Systemic approaches to the examination of core developmental issues. In M. R. Gunnar & E. Thelen (Eds.), *Systems and development* (pp. 35–75). Hillsdale, NJ: Erlbaum.

Fiese, B. H., Sameroff, A. J., Grotevant, H. D., Wamboldt, F. S., Dickstein, S., & Fravel, D. L. (1999). The stories that families tell: Narrative coherence, narrative interaction, and relationship beliefs. *Monographs of the Society for Research in Child Development, 64*(2, Serial No. 257).

Ford, D. H. (1987). *Humans as self-constructing living systems: A developmental perspective on personality and behavior*. Hillsdale, NJ: Erlbaum.

Ford, D. H., & Lerner, R. M. (1992). *Developmental systems theory: An integrative approach*. Newbury Park, CA: Sage.

Forgas, J. P. (2002). Feeling and doing: Affective influences on interpersonal behavior. *Psychological Inquiry, 13,* 1–28.

Forgas, J. P., & van Heck, G. L. (1992). The psychology of situations. In G. V. Caprara & G. L. van Heck (Eds.), *Modern personality psychology* (pp. 418–455). New York: Harvester.

Galambos, N. L., Kolaric, G. C., Sears, H. A., & Maggs, J. L. (1999). Adolescents' subjective age: An indicator of perceived maturity. *Journal of Research on Adolescence, 9,* 309–337.

Galton, F. (1869). *Hereditary genius: An inquiry into its laws and consequences*. London: MacMillan.

Gangestad, S., & Snyder, M. (1985). To carve nature at its joints: On the existence of discrete classes in personality. *Psychological Review, 92,* 317–349.

Garcia Coll, C., Bearer, R., & Lerner, R. M. (Eds.). (2004). *Nature and nurture: The complex interplay of genetic and environmental influences on human behavior and development*. Mahwah, NJ: Erlbaum.

Garraghty, P. E., Churchill, J. D., & Banks, M. K. (1998). Adult neural plasticity: Similarities between two paradigms. *Current Directions in Psychological Science, 7*(3), 87–91.

Ge, X., Brody, G. H., Conger, R. D., Simons, R. L., & Murry, V. M. (2002). Contextual amplification of pubertal transition effects on deviant peer affiliation and externalizing behavior among African American children. *Developmental Psychology, 38,* 42–54.

Gershman, E. S., & Hayes, D. S. (1983). Differential stability of reciprocal friendships and unilateral relationships among preschool children. *Merrill-Palmer Quarterly, 29,* 169–177.

Gibson, W. A. (1959). Three multivariate models: Factor analysis, latent structure analysis and latent profile analysis. *Psychometrica, 24,* 229–252.

Glaser, D. (2000). Child abuse and neglect and the brain: A review. *Journal of Child Psychology and Psychiatry, 41,* 97–116.

Goodwin, B. (1994). *How the leopard changed its spots.* London: Phoenics Giants.

Gottlieb, G. (1991). Experimental canalization of behavioral development: Theory. *Developmental Psychology, 27,* 4–13.

Gottlieb, G. (1996). A systems view of psychobiological development. In D. Magnusson (Ed.), *The life-span development of individuals: Behavioral, neurobiological and psychosocial perspectives* (pp. 76–104). Cambridge, England: Cambridge University Press.

Gottlieb, G. (2000). Environmental and behavioral influences on gene activity. *Current Directions in Psychological Science, 9,* 93–97.

Gottlieb, G. (2003). Probabilistic epigenesis of development. In J. Valsiner & K. J. Connolly (Eds.), *Handbook of developmental psychology* (pp. 3–17). Thousand Oaks: Sage.

Gottlieb, G., Wahlsten, D., & Lickliter, R. (1998). The significance of biology for human development: A developmental psychobiological systems view. In W. Damon (Editor-in-Chief) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 233–273). New York: Wiley.

Graham, S. (1992). "Most of the subjects were White and middle class." *American Psychologist, 47*(5), pp. 629–639.

Gramer, M., & Huber, H. P. (1994). Individual variability in task-specific cardiovascular response patterns during psychological challenge. *German Journal of Psychology, 18,* 1–17.

Greenberger, E., O'Neil, R., & Nagel, S. (1994). Linking workplace and homeplace: Relations between the nature of adults' work and their parenting behaviors. *Developmental Psychology, 30,* 990–1002.

Greenwald, A. G., & Banaji, M. R. (1995). Implicit social cognition: Attitudes, self-esteem, and stereotypes. *Psychological Review, 102,* 4–27.

Gustafson, S. B., & Magnusson, D. (1991). Female life careers: A longitudinal person approach to female educational and vocational pathways. In D. Magnusson (Vol. Ed.), *Paths through life* (Vol. 3). Hillsdale, NJ: Erlbaum.

Gustafson, S. B., Stattin, H., & Magnusson, D. (1989). *Aspects of the development and moderation of sex role orientation among females: A longitudinal study* (Report No. 694). University of Stockholm, Department of Psychology.

Gustafson, S. B., Stattin, H., & Magnusson, D. (1992). Aspects of the development of a career versus homemaking orientation among females: The longitudinal influence of educational motivation and peers. *Journal of Research on Adolescence, 2,* 241–259.

Harkness, S. (1992). Cross-cultural research in child development: A sample of the state of the art. *Developmental Psychology, 28,* 622–625.

Harkness, S., & Super, C. M. (2002). Culture and parenting. In M. H. Bornstein (Ed.), *Handbook of parenting: Vol. 2. Biology and ecology of parenting* (2nd ed., pp. 253–280). Mahwah, NJ: Erlbaum.

Harré, R. (2000). Acts of living. *Science, 289,* 1303–1304.

Harré, R., & Gillett, G. (1990). *The discursive mind.* Thousand Oaks, CA: Sage.

Harter, S. (1983). Developmental perspectives on the self system. In P. H. Mussen (Series Ed.) & E. M. Hetherington (Vol. Ed.), *Handbook of child psychology: Vol. 4. Socialization, personality and social development* (4th ed., pp. 275–385). New York: Wiley.

Harter, S. (1990). Causes, correlates, and the functional role of global self-worth: A life-span perspective. In R. J. Sternberg & J. Kolligan Jr. (Eds.), *Competence considered* (pp. 67–97). New Haven, CT: Yale University Press.

Hartman, J. L., IV, Garvik, B., & Hartwell, L. (2001). Principles for the buffering of genetica variation. *Science, 291,* 1001–1004.

Hartup, W. W. (1996). The company they keep: Friendships and their developmental significance. *Child Development, 67,* 1–13.

Hartup, W. W., & van Lieshout, C. F. M. (1995). Personality development in social context. *Annual Review of Psychology, 46,* 655–687.

Haugaard, J. J., & Hazan, C. (2003). Adoption as a natural experiment. *Development and Psychopathology, 15,* 909–926.

Helson, H. (1964). *Adaptation level theory.* New York: Harper & Row.

Hendry, L. B., Shucksmith, J., & Glendinning, A. (1995). *Adolescent focal theories: An empirical perspective.* Aberdeen, Scotland: University of Aberdeen, Department of Education.

Hess, B., & Mikhailov, A. (1994). Self-organization in living cells. *Science, 164*(8), 223–224.

Hettema, P. J. (1979). *Personality and adaptation.* Amsterdam: North Holland.

Hinde, R. A. (1992). Developmental psychology in the context of other behavioral sciences. *Developmental Psychology, 28,* 622–625.

Hinde, R. A. (1996). The interpenetration of biology and culture. In D. Magnusson (Ed.), *The life-span development of individuals: Behavioral, neurobiological and psychosocial perspectives* (pp. 359–375). Cambridge, England: Cambridge University Press.

Hinde, R. A., & Dennis, A. (1986). Categorizing individuals: An alternative to linear analysis. *International Journal of Behavioral Development, 9,* 195–219.

Holden, C. (2004). The origin of speech. *Science, 303,* 1316–1319.

Horn, J. L., & Donaldson, G. (1976). On the myth of intellectual decline in adulthood. *American Psychologist, 31,* 701–709.

Horowitz, F. D. (1989). Commentary: Process and systems. In M. R. Gunnar & E. Thelen (Eds.), *Systems and development* (pp. 35–75). Hillsdale, NJ: Erlbaum.

Hubel, D. H., & Wiesel, T. N. (1970). The period of susceptibility to the physiological effects of unilateral eye closer in kittens. *Journal of Physiology, 206,* 419–436.

Huizink, A. C., Mulder, E. J. H., & Buitelaar, J. K. (2004). *Psychological Bulletin, 130,* 113–142.

Hull, C. L. (1943). The problem of intervening variables in molar behavior theory. *Psychological Review, 50,* 273–291.

Hunt, D. E. (1975). Person-environment interaction: A challenge found wanting before it was tried. *Review of Educational Research, 45,* 209–230.

Hunt, J. McV. (1961). *Intelligence and experience.* New York: Ronald Press.

Hunt, J. McV. (1966). The epigenesis of intrinsic motivation and early cognitive learning. In R. N. Hober (Ed.), *Current research in motivation* (pp. 355–370). New York: Holt, Rinehart and Winston.

Husén, T. (1989). Educational research at the crossroads? An exercise in self-criticism. *Prospects, 3*(19), 351–360.

Ideker, T., Galitski, T., & Hood, L. (2001). A new approach to decoding life. *Annual Reviews of Genomics and Human Genetics, 2,* 343–372.

Irvine, S. (1969). Culture and mental ability. *New Scientist, 1,* 230–231.

Jacob, F. (1976). *The logic of life: A history of heredity.* New York: Random House.

James, W. (1890). *The principles of psychology.* New York: Holt, Rinehart and Winston.

Järvelä, S., & Volet, S. (2004). Motivation in real-life, dynamic, and interactive learning environments: Stretching constructs and methodologies. *European Psychologist, 9*(4), 193–197.

Jeeves, M. (2004). Human nature without a soul? *European Review, 12,* 45–64.

Jessor, R., & Jessor, S. L. (1977). *Problem behavior and psychosocial development: A longitudinal study of youth.* New York: Academic Press.

Johnson, M. H. (2001). Functional brain development in humans. *Nature Review Neuroscience, 2,* 475–483.

Kafatos, F. C., & Eisner, T. (2004). Unification in the century of biology. *Science, 303,* 1257.

Kagan, J. (1992). Yesterday's premises, tomorrows promises. *American Psychologist, 28,* 990–997.

Kagan, J. (2003). Biology, context, and developmental inquiry. *Annual Review of Psychology, 54,* 1–23.

Kagan, J., Snidman, N., & Arcus, D. (1998). The value of extreme groups. In R. B. Cairns, L. R. Bergman, & J. Kagan (Eds.), *Methods and models for studying the individual* (pp. 65–80). Thousand Oaks, CA: Sage.

Kalverboer, A. F., & Hopkins, B. (1983). General introduction: A biopsychological approach to the study of human behavior. *Journal of Child Psychology and Psychiatry, 24,* 9–10.

Kalverboer, A. F., Hopkins, B., & Geuze, R. (1993). *Motor development in early and later childhood: Longitudinal approaches.* Cambridge, England: Cambridge University Press.

Kandel, D. B. (1978). Similarity in real-life friendship pairs. *Journal of Personality and Social Psychology, 36,* 306–312.

Kandel, E. R., & Schwartz, J. H. (1982). Molecular biology of learning: Modulation of transmitter release. *Science, 218,* 433–443.

Karli, P. (1996). The brain and socialization: A two-way mediation across the life course. In D. Magnusson (Ed.), *The life-span development of individuals: Behavioral, neurobiological and psychosocial perspectives* (pp. 341–356). Cambridge, England: Cambridge University Press.

Karli, P. (2000). The interaction between the self and the environment: A two way traffic due to the brain. *European Review,* 215–224.

Kelso, J. A. S. (2001). Self-organizing dynamical systems. In N. J. Smelser & P. B. Baltes (Eds.), *International Encyclopedia of Social and Behavioral Sciences* (Vol. 20, pp. 1384–1350). Amsterdam: Elsevier.

Kelvin, P. (1969). *The bases of social behavior: An approach in terms of order and value.* London: Holt, Rinehart and Winston.

Kempermann, G., & Gage, F. H. (1999, May). New nerve cells for the adult brain. *Scientific American,* 38–43.

Kerr, M., & Stattin, H. (2003). Parenting of adolescents: Action or reaction. In A. C. Crouter & A. Booth (Eds.), *Children's influence on family dynamics: The neglected side of family relationships* (pp. 121–152). Mahwah: NJ: Erlbaum.

Kiesner, J., Kerr, M., & Stattin, H. (2004). "Very Important Persons" in adolescence: Going beyond in-school, single friendships in the study of peer homophily. *Journal of Adolescence, 27,* 545–560.

Kihlbom, M., & Johansson, S. E. (2004). Month of birth: Socioeconomic background and development in Swedish men. *Journal of Biosocial Science, 36,* 561–571.

Kihlstrom, J. F. (1990). The psychological unconscious. In L. A. Pervin (Ed.), *Handbook of personality: Theory and research* (pp. 445–468). New York: Guilford Press.

Klaczynski, P. A. (1990). Cultural-developmental tasks and adolescent development: Theoretical and methodological considerations. *Adolescence, 25,* 811–823.

Kloep, M. (1995). Concurrent and predictive correlates of girls' depression and antisocial behavior under conditions of economic crisis and value change: The case of Albania. *Journal of Adolescence, 18,* 445–458.

Koestler, A. (1978). *Janus: A summing up.* London: Hutchingson.

Kohlberg, L., LaCrosse, J., & Ricks, D. (1972). The predictability of adult mental health from childhood behavior. In B. Wolman (Ed.), *Manual of child psychopathology.* New York: McGraw-Hill.

Kreppner, K. (1992a). Development in a developing context: Rethinking the family's role for children's development. In L. C. Vinegar & J. Valsiner (Eds.), *Children's development within social context* (pp. 1–13). Hillsdale, NJ: Erlbaum.

Kreppner, K. (1992b). William L. Stern, 1871–1938: A neglected funder of developmental psychology. *Developmental Psychology, 28,* 539–547.

Kreppner, K., & Lerner, R. M. (1989). Family systems and life-span development: Issues and perspectives. In K. Kreppner & R. M. Lerner (Eds.), *Family systems and life-span development* (pp. 1–13). Hillsdale, NJ: Erlbaum.

Krupat, E. (1974). Context as a determinant of perceived threat: The role of prior experience. *Journal of Personality and Social Psychology, 29,* 731–736.

Kuo, Z.-Y. (1967). *The dynamics of behavior development: An epigenetic view.* New York: Random House.

Lagercrantz, H., Aperia, A., Ritzen, M., & Rydelius, P.-A. (1997). Genetic versus environmental determinations of human behavior and health. *Acta Pediatrica, 86*(Suppl. 22).

Landy, F. J. (1978). An opponent process theory of job satisfaction. *Journal of Applied Psychology, 63,* 533–547.

LeDoux, J. (1996). *The emotional brain: The mysterious underpinning of emotional life.* New York: Simon and Shuster.

Lehrman, D. S. (1970). Semantic and conceptual issues in the nature-nurture problem. In L. R. Aronsson, E. Tobach, D. S. Lehrman, & J. S. Rosenblatt (Eds.), *Development and evolution of behavior: Essays in memory of T. C. Schneirla* (pp. 17–52). San Francisco: Freeman.

Lerner, R. M. (1978). Nature, nurture, and dynamic interactionism. *Human Development, 21,* 1–20.

Lerner, R. M. (1983). A "goodness of fit" model of person-interaction. In D. Magnusson & V. L. Allen (Eds.), *Human development: An interactional perspective* (pp. 279–294). New York: Academic Press.

Lerner, R. M. (1989). Individual development and the family system: A life-span perspective. In K. Kreppner & R. M. Lerner (Eds.), *Family systems and life-span development* (pp. 15–31). Hillsdale, NJ: Erlbaum.

Lerner, R. M. (1990). Plasticity, person-relations, and cognitive training in the aged years: A developmental perspective. *Developmental Psychology, 27,* 911–915.

Lerner, R. M. (1991). Changing organism: Relations as the basic process of development—A developmental perspective. *Developmental Psychology, 27,* 27–32.

Lerner, R. M. (1995). *America's youth in crisis: Challenges and options for programs and policies.* Thousand Oaks, CA: Sage.

Lerner, R. M., & Lerner, J. V. (1987). Children in their contexts: A goodness of fit model. In J. B. Lancaster, J. Altmann, A. S. Rossi, & L. R. Sherrod (Eds.), *Parenting across the life span: Biosocial dimensions.* Chicago: Aldine.

Lerner, R. M., Skinner, E. A., & Sorell, G. T. (1980). Methodological implications of dialectic theories of development. *Human Development, 23,* 225–235.

Leshner, A. I. (2004). Science at the leading edge. *Science, 303,* 729.

Levi-Montalcini, R. (1988). *In praise of imperfection.* New York: Basic Books.

Levine, S. (1982). Comparative and psychobiological perspectives on development. In W. A. Collins (Ed.), *Minnesota Symposium on Child Psychology: Vol. 15. The concept of development.* Hillsdale, NJ: Erlbaum.

Lewin, K. (1931). Environmental forces. In C. Murchison (Ed.), *A handbook of child psychology* (pp. 590–625). Worcester, MA: Clark University Press.

Lewin, K. (1935). *A dynamic theory of personality.* New York: McGraw-Hill.

Lewis, M. D. (2000). The promise of dynamic systems approaches for an integrated account of human development. *Child Development, 71,* 36–43.

Li, S.-C. (2003). Biocultural orchestration of developmental plasticity across levels: The interplay of biology and culture in shaping the mind and behavior across the lifespan. *Psychological Bulletin, 129,* 171–194.

Li, S.-C., Lindenberger, U., Hommel, B., Aschersleben, G. R., Prinz, W., & Baltes, P. B. (2004). Transformations in the couplings among intellectual abilities and constituent cognitive processes across the life span. *Psychological Science, 15,* 155–163.

Lickliter, R., & Honeycutt, H. (2003a). Developmental dynamics of evolutionary psychology: Status quo or irreconcilable views. *Psychological Bulletin, 129,* 866–872.

Lickliter, R., & Honeycutt, H. (2003b). Developmental dynamics: Toward a biologically plausible evolutionary psychology. *Psychological Bulletin, 129,* 819–839.

Lienert, G. A., & zur Oeveste, H. (1985). CFA as a statistical tool for developmental research. *Educational and Psychological Measurement, 45,* 301–307.

Lindberg, U. (2000). Cellers samspel och medvetandets grund [Cells' interactions and the basis of consciousness]. In *Ytor på djupet* [Plains in the depth] (pp. 65–83). Stockholm: The Swedish Council for Research in Natural Sciences, Annual Report 1998/1999.

Little, T. D., Oettingen, G., Stetsenko, A., & Baltes, P. B. (1995). Children's action-control beliefs about school performance: How do American children compare with German and Russian children? *Journal of Personality and Social Psychology, 69,* 686–700.

Locke, J. (1690). *An essay concerning human understanding.* London: Routledge.

Löfgren, L. (2004). Unifying foundations: To be seen in the phenomenon of language. *Foundations of Science, 9,* 135–189.

Lundberg, I. (2006). Early language development as related to the acquisition of reading. *European Review, 14*(1), 65–79.

Lundberg, U. (2005). Stress hormones in health and disease. The role of work and gender. *Psychoneuroendicrinology, 30,* 1017–1021.

Luria, A. R. (1976). *Cognitive Development: Its' cultural and social foundations.* Cambridge, MA: Harvard University Press.

Maccoby, E. E. (1990). Gender and relationships: A developmental account. *American Psychologist, 46,* 513–520.

Maccoby, E. E. (1992). The role of parents in the socialization of children: An historical overview. *Developmental Psychology, 28,* 1006–1017.

Maccoby, E. E. (2003). The gender of child and parent as factors in family dynamics. In A. C. Crouter & A. Booth (Eds.), *Children's influence on family dynamics: The neglected side of family relationships* (pp. 191–206). Mahwah, NJ: Erlbaum.

Maccoby, E. E., & Jacklin, C. N. (1983). The "person" characteristics of children and the family as environment. In D. Magnusson & V. L. Allen (Eds.), *Human development: An interactional perspective* (pp. 76–91). New York: Academic Press.

Magnusson, D. (1967). *Test theory.* Reading, MA: Addison-Wesley.

Magnusson, D. (1980). Personality in an interactional paradigm of research. *Zeitschrift fur Differentielle und Diagnostische Psychologie, 1,* 17–34.

Magnusson, D. (1981). *Toward a psychology of situations: An interactional perspective.* Hillsdale, NJ: Erlbaum.

Magnusson, D. (1988). Individual development from an interactional perspective. In D. Magnusson (Ed.), *Paths through life* (Vol. 1). Hillsdale, NJ: Erlbaum.

Magnusson, D. (1990). Personality development from an interactional perspective. In L. Pervin (Ed.), *Handbook of personality* (pp. 193–222). New York: Guilford Press.

Magnusson, D. (1992). Back to the phenomena: Theory, methods and statistics in psychological research. *European Journal of Personality, 6,* 1–14.

Magnusson, D. (1993). Human ontogeny: A longitudinal perspective. In D. Magnusson & P. Casaer (Eds.), *Longitudinal research on individual development: Present status and future perspectives* (pp. 1–25). Cambridge, England: Cambridge University Press.

Magnusson, D. (1995). Individual development: A holistic integrated model. In P. Moen, G. H. Elder, & K. Luscher (Eds.), *Linking lives in context: Perspective on the ecology of human development* (pp. 19–60). Washington, DC: American Psychological Association.

Magnusson, D. (1996a). The patterning of antisocial behavior and autonomic reactivity: Results from Sweden. In D. M. Stoff & R. B. Cairns (Eds.), *Aggression and violence: Genetic, neurobiological, and biosocial perspectives* (pp. 291–308). Mahwah, NJ: Erlbaum.

Magnusson, D. (Ed.) (1996b). *The life-span development of individuals: Behavioral, neurobiological and psychosocial perspectives.* Cambridge, England: Cambridge University Press.

Magnusson, D. (1998). The logic and implications of a person approach. In R. B. Cairns, L. R. Bergman, & J. Kagan (Eds.), *Methods and models for studying the individual* (pp. 33–64). Thousand Oaks, CA: Sage.

Magnusson, D. (1999a). Holistic interactionism: A perspective for research on personality development. In L. A. Pervin & O. P. John (Eds.), *Handbook of personality: Theory and research* (2nd ed., pp. 219–247). New York: Guilford Press.

Magnusson, D. (1999b). Individual development: Toward a developmental science. *Proceedings of the American Philosophoical Society, 143,* 86–96.

Magnusson, D. (2000). Developmental science. In A. E. Kazdin (Ed.), *Encyclopedia of Psychology* (Vol. 3, pp. 24–26). New York: American Psychological Association and Oxford Press.

Magnusson, D. (2001). The holistic-interactionistic paradigm: Some directions for empirical developmental research. *European Psychologist, 6,* 153–162.

Magnusson, D. (2003). The person approach: Concepts, measurement models, and research strategy. *New Directions for Child and Adolescent Development, 101,* 3–23.

Magnusson, D., & Allen, V. L. (1983a). Implications and applications of an interactional perspective for human development. In D. Magnusson & V. L. Allen (Eds.), *Human development: An interactional perspective* (pp. 369–387). Orlando, FL: Academic Press.

Magnusson, D., & Allen, V. L. (1983b). An interactional perspective for human development. In D. Magnusson & V. L. Allen (Eds.), *Human development: An interactional perspective* (pp. 3–31). New York: Academic Press.

Magnusson, D., Andersson, T., & Törestad, B. (1993). Methodological implications of a peephole perspective on personality. In D. C. Funder, R. D. Parke, C. Tomlinson-Keasey, & K. Widaman (Eds.), *Studying lives through time: Personality and development* (pp. 207–220). Washington, DC: American Psychological Association.

Magnusson, D., & Bergman, L. R. (1990). A pattern approach to the study of pathways from childhood to adulthood. In L. N. Robins & M. Rutter (Eds.), *Straight and devious pathways from childhood to adulthood* (pp. 101–115). New York: Cambridge University Press.

Magnusson, D., Bergman, L. R., Rudinger, G., & Törestad, B. (1991). *Problems and methods in longitudinal research: Stability and change.* Cambridge, England: Cambridge University Press.

Magnusson, D., & Cairns, R. B. (1996). Developmental science: Toward a unified framework. In R. B. Cairns, G. H. Elder Jr., & E. J. Costello (Eds.), *Developmental science* (pp. 7–30). New York: Cambridge University Press.

Magnusson, D., & Casaer, P. (1993). *Longitudinal research on individual development: Present status and future perspectives.* Cambridge, England: Cambridge University Press.

Magnusson, D., Dunér, A., & Zetterblom, G. (1975). *Adjustment: A longitudinal study.* Stockholm: Almqvist & Wiksell.

Magnusson, D., & Endler, N. S. (1977). Interactional psychology: Present status and future prospects. In D. Magnusson & N. S. Endler (Eds.), *Personality at the crossroads: Current issues in interactional psychology* (pp. 3–31). Hillsdale, NJ: Erlbaum.

Magnusson, D., Gerzén, M., & Nyman, B. (1968). The generality of behavioral data I: Generalization from observations on one occasion. *Multivariate Behavioral Research, 3,* 295–320.

Magnusson, D., & Heffler, B. (1969). The generality of behavioral data III: Generalization potential as a function of the number of observation instances. *Multivariate Behavioral Research, 4,* 29–42.

Magnusson, D., af Klinteberg, B., & Stattin, H. (1993). Autonomic activity/reactivity, behavior, and crime in a longitudinal perspective. In J. McCord (Ed.), *Facts, frameworks, and forecasts* (pp. 287–318). New Brunswick, NJ: Transaction.

Magnusson, D., & Mahoney, J. L. (2003). A holistic approach for research on positive development. In L. G. Aspinwall & U. M. Staudinger (Eds.), *A psychology of human strengths: Fundamental questions and future directions for a positive psychology* (pp. 227–243). Washington, DC: American Psychological Association.

Magnusson, D., & Stattin, H. (1998). Person context interaction theories. In W. Damon (Editor-in-Chief) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 685–759). New York: Wiley.

Magnusson, D., Stattin, H., & Allen, V. L. (1985). Biological maturation and social development: A longitudinal study of some adjustment processes from mid-adolescence to adulthood. *Journal of Youth and Adolescence, 14,* 267–283.

Magnusson, D., & Törestad, B. (1992). The individual as an interactive agent in the environment. In W. B. Walsh, K. Craig, & R. Price (Eds.), *Person-environment psychology: Models and perspectives* (pp. 89–126). Hillsdale, NJ: Erlbaum.

Magnusson, D., & Törestad, B. (1993). A holistic view of personality: A model revisited. *Annual Review of Psychology, 44,* 427–452.

Maier, S. F., & Watkins, L. R. (2000). The immune system as a sensory system: Implications for psychology. *Current directions in psychological science, 9*(3), 98–102.

Manly, B. F. (1994). *Multivariate statistical methods: A primer* (2nd ed.). London: Chapman & Hall.

Manturzewska, M. (1990). A biographical study of the life-span development of professional musicians. *Psychology of Music, 18,* 112–139.

Mayr, E. (1976). *Evolution and the diversity of life.* Cambridge, MA: Harvard University Press.

Mayr, E. (1997). *This is biology.* Cambridge, MA: Belknap Press.

Mayr, E. (2000a, July). Darwin's influence on modern thought. *Scientific American,* 67–71.

Mayr, E. (2000b). Biology in the twenty-first century. *Bioscience, 50*(10), 895–897.

McCall, R. B. (1977). Challenges to a science of developmental psychology. *Child Development, 48,* 333–344.

McCall, R. B. (1981). Nature, nurture and the two realms of development: A proposed integration with respect to mental development. *Child Development, 52,* 1–12.

McClintock, E. (1983). Interaction. In H. H. Kelley, E. Berscheid, A. Christensen, J. H. Harvey, T. L. Huston, G. Levinger, et al. (Eds.), *Close relationships.* New York: Freeman.

McClintock, M. K. (1971). Menstrual synchrony and suppression. *Nature, 229,* 224–225.

McCord, J. (1997). "He did it because he wanted to . . ." In W. Osgood (Ed.), *Nebraska Symposium on Motivation: Vol.14. Motivation and delinquency* (pp. 1–43). Lincoln: University of Nebraska Press.

McCrone, J. (1993). *The myth of irrationality.* London: McMillan.

McEwen, B. S. (1998). Protective and damaging effects of stress mediators: Allostasis and allostatic load. *New England Journal of Medicine, 338,* 171–179.

Medawar, P. (1984). *Plato's republic.* Oxford, England: Oxford University Press. (Original work published 360 B.C.)

Meyer-Probst, B., Röesler, H.-D., & Teichmann, H. (1983). Biological and psychosocial risk factors and development during childhood. In D. Magnusson & V. L. Allen (Eds.), *Human development: An interactional perspective* (pp. 344–369). Orlando, FL: Academic Press.

Miccery, T. (1989). The unicorn, the normal curse, and other improbable creatures. *Psychological Bulletin, 105,* 156–166.

Miller, J. G. (1978). *Living systems.* New York: McGraw-Hill.

Mills, P., Dimsdale, J. E., Nelesen, R. A., Jasievicz, J., Ziegler, G., & Kennedy, B. (1994). Patterns of adrenergic receptors and adrenergic agonists underlying cardiovascular responses to a psychological challenge. *Psychological Medicine, 56,* 70–56.

Minuchin, P. (1985). Families and individual development: Provocations from the field of family therapy. *Child Development, 56,* 289–301.

Mischel, W. (1973). Toward a cognitive social learning reconceptualizing of personality. *Psychological Review, 80,* 252–283.

Mischel, W. (2004). Toward an integrative science of the person. *Annual Review of Psychology, 55,* 1–22.

Moffitt, T. E., Caspi, A., Fawcett, P., Brammer, G. L., Raleigh, M., Yuwiler, A., et al. (1997). Whole blood serotonin and family background relate to male violence. In A. Raine, P. A. Brennan, D. P. Farrington, & S. A. Mednick (Eds.), *Biosocial bases of violence* (pp. 231–249). New York: Plenum Press.

Molenaar, P. C. M., Boomsma, D. I., & Dolan, C. V. (1991). Genetic and environmental factors in a developmental perspective. In D. Magnusson, L. R. Bergman, G. Rudinger, & B. Törestad. *Problems and methods in longitudinal research: Stability and change* (pp. 250–273). Cambridge, England: Cambridge University Press.

Molenaar, P. C. M., Huizenga, H. M., & Nesselroade, J. R. (2002). The relationship between the structure of inter-individual and intra-individual variability: A theoretical and empirical indication of developmental systems theory. In U. M. Staudinger & U. Lindberger (Eds.), *Understanding human development* (pp. 339–360). Dordrecht, The Netherlands: Kluwer Press.

Montgomery, S. (2004). Of towers, walls, and fields: Perspectives of language in science. *Science, 303,* 1333–1335.

Moore, B. (2000). Sustaining earth's life support system: The challenge for the next decade and beyond. *Global Change Newsletter, 41,* 1–2.

Moreland, R. L., & Zajonc, R. B. (1982). Exposure effects in person perception: Familiarity, similarity and attraction. *Journal of Experimental Social Psychology, 18,* 395–415.

Nagin, D. S., & Tremblay, R. E. (2001). Parental and early childhood predictors of persistent physical aggression in boys from kindergarten to high school. *Archives of General Psychiatry, 58,* 389–394.

Neckerman, H. J. (1992). *A longitudinal investigation of the stability and fluidity of social networks and peer relationships of children and adolescents.* Unpublished doctoral dissertation, University of North Carolina, Chapel Hill.

Nelson, C. A. (1999a). How important are the first three years of life? *Applied Developmental Science, 3,* 235–238.

Nelson, C. A. (1999b). Neural plasticity and human development. *Current Directions in Psychological Science, 8*(2), 42–45.

Nesselroade, J. R., & Featherman, D. L. (1991). Intraindividual variability in older adults' depression scores: Some implications for developmental theory and longitudinal research. In D. Magnusson, L. R. Bergman, G. Rudinger, & B. Törestad (Eds.), *Stability and change: Methods and models for data treatment* (pp. 47–66). Cambridge, England: Cambridge University Press.

Nesselroade, J. R., & Ford, D. H. (1987). Methodological considerations in modeling living systems. In M. E. Ford & D. H. Ford (Eds.), *Humans as self-constructing living systems: Putting the framework to work* (pp. 47–79). Hillsdale, NJ: Erlbaum.

Nesselroade, J. R., & Molenaar, P. C. M. (2003). Quantitative models for developmental processes. In J. Valsiner & K. J. Connolly (Eds.), *Handbook of developmental psychology* (pp. 622–639). Thousand Oaks, CA: Sage.

Nesselroade, J. R., & Schmidt McCollam, K. (2000). Putting the process in developmental processes. *International Journal of Behavioral Development, 24*(3), 295–300.

Nilsson, L.-G., Adolfsson, R., Bäckman, L., de Frias, C. M., Molander, B., & Nyberg, L. (2004). Betula: A prospective cohort study on memory, health, and aging. *Aging Neuropsychology and Cognition, 11*(2/3), 134–148.

Novikoff, B. (1945). The concept of integrative levels and biology. *Science, 2,* 209–215.

Nurmi, J.-E. (1991). How do adolescents see their future? A review of the development of future orientation and planning. *Developmental Review, 11.*

Nurmi, J.-E. (Ed.). (2002). *Navigating through adolescence: European perspectives* (Michigan State University Series on Families and Child Development). New York: Routledge.

Nurmi, J.-E., Salmela-Aro, K., & Koivisto, P. (2002). Goal importance, related achievement-beliefs and emotions during the transition from vocational school to work: Antecedents and consequences. *Journal of Vocational Behavior, 60,* 241–261.

O'Connor, T. G. (2003). Natural experiments to study the effects of early experience: Progress and limitations. *Development and Psychopathology, 15,* 837–852.

Oettingen, G., Little, T. D., Lindenberger, U., & Baltes, P. B. (1994). Causality, agency, and control beliefs in East versus West Berlin children: A natural experiment on the role of context. *Journal of Personality and Social Psychology, 66,* 579–595.

Ogbu, J. (1981). Origins of human competence: A cultural-ecological perspective. *Child Development, 52,* 413–429.

Öhman, A. (2002). Automaticity and the amygdala: Nonconscious responses to emotional faces. *Current Directions in Psychological Science, 11,* 62–66.

O'Leary, D. D. M. (1996). Development of the functionally-specialized areas of the mammalian neocortex. In D. Magnusson (Ed.), *The life-span development of individuals: Behavioral, neurobiological and psychosocial perspectives* (pp. 23–37). Cambridge, England: Cambridge University Press.

Oliveri, M. E., & Reiss, D. (1987). Social networks of family members: Distinctive roles of mothers and fathers. *Sex Roles, 17,* 719–736.

Olson, D. H., McCubin, H. I., Barnes, H., Larsen, A., Muxen, M., & Wilson, M. (1983). *Families: What makes them work.* Los Angeles: Sage.

Ortiz, J., & Raine, A. (2004). Heart rate level and antisocial behavior in children and adolescents: A meta-analysis. *Journal of the American Academy of Child and Adolescent Psychiatry, 43,* 154–162.

Overton, W. F. (1998). Developmental psychology: Philosophy, concepts, and methodology. In W. Damon (Editor-in-Chief) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 107–188). New York: Wiley.

Ozer, D. J. (1993). The Q-Sort Method and the Study of Personality Development. In D. C. Funder, R. D. Parke, C. Tomlinson-Keasey, & K. Widaman (Eds.), *Studying lives through time: Personality and development* (pp. 147–168). Washington, DC: American Psychological Association.

Packer, M., Medina, N., Yushak, M., & Meller, J. (1983). Hemodynamic patterns of response during long-term captopril therapy for severe chronic heart failure. *Circulation, 68,* 103–112.

Pasquale, E. (2000). Turning attraction into repulsion. *Science, 289,* 1308–1309.

Patterson, G. R., & Moore, D. R. (1978). Interactive patterns of units. In S. J. Suomi, M. E. Lamb, & R. G. Stevenson (Eds.), *The study of social interaction: Methodological issues.* Madison: University of Wisconsin Press.

Pervin, L. A. (1978). Definitions, measurements, and classification of stimuli, situations, and environments. *Human Ecology, 6,* 71–105.

Pervin, L. A. (1983). The stasis and flow of behavior: Toward a theory of goals. In M. M. Page (Ed.), *Nebraska Symposium on Motivation* (pp. 1–53). Lincoln: Nebraska University Press.

Petersen, A. (1993). Presidential address: Creating adolescents—The role of and process in developmental trajectories. *Journal of Research on Adolescence, 3,* 1–18.

Petersen, A. C., & Taylor, B. (1980). The biological approach to adolescence: Biological change and psychological adaptation. In J. Adelson (Ed.), *Handbook of adolescent psychology* (pp. 117–155). New York: Wiley.

Peterson, D. R. (1979). Assessing interpersonal relationships by means of interation research. *Behavioral Assessment, 1,* 221–276.

Phelps, E., Furstenberg, F. F., Jr., & Colby, A. (Eds.). (2002). *Looking at lives: American Longitudinal Studies of the Twentieth Century.* New York: Russell Sage Foundation.

Piaget, J. (1964). Development and learning. *Journal of Research in Science Teaching, 2,* 176–186.

Pickles, A., & Rutter, M. (1991). Statistical and conceptual models of "turning points" in developmental processes. In D. Magnusson, L. R. Bergman, G. Rudinger, & B. Törestad (Eds.), *Problems and methods in longitudinal research: Stability and change* (pp. 133–166). Cambridge, England: Cambridge University Press.

Poincaré, H. (1946). *The foundations of science.* Lancaster, England: Science Press.

Popper, K. R., & Eccles, J. C. (1977). *The self and its brain.* Berlin, Germany: Springer Verlag.

Preyer, W. (1908). *The mind of the child.* New York: Appleton-Century.

Pulkkinen, L., & Rönkä, A. (1994). Personal control over development, identity formation, and future orientation as components of life orientation: A developmental approach. *Developmental Psychology, 30,* 260–271.

Radke-Yarrow, M., & Kuczynski, L. (1983). Conceptions of the environment in childrearing interactions. In D. Magnusson & V. L. Allen (Eds.), *Human development: An interactional perspective* (pp. 51–74). New York: Academic Press.

Raine, A. (1997). Antisocial behavior and psychophysiology: A biosocial perspective and a prefrontal dysfunction hypothesis. In D. M. Stoff, J. Breiling, & J. D. Maser (Eds.), *Handbook of antisocial behavior* (pp. 289–304). New York: Wiley.

Raine, A. (2002). Biosocial studies of antisocial and violent behavior in children and adults: A review. *Journal of Abnormal Child Psychology, 30,* 311–326.

Raleigh, M. J., McGuire, M. T., Brammer, G. L., & Yuwiler, J. (1984). Social and environmental influences on blood serotonin concentration in monkeys. *Archives of General Psychiatry, 41,* 405–410.

Reinhardt, J. M. (1937). Personality traits and the situation. *American Journal of Sociology, 2,* 492–500.

Richters, J. E. (1997). The Hubble hypothesis and the developmentalist's dilemma. *Development and Psychopathology, 9,* 193–229.

Riegel, K. F. (1975). Toward a dialectical theory of development. *Human Development, 18,* 50–64.

Riegel, K. F. (1976). The dialectics of human development. *American Psychologist, 31,* 689–700.

Robins, L. N. (1966). *Deviant children grow up.* Baltimore: Williams and Wilkens.

Roland, E. (1993). *Brain activation.* New York: Wiley-Liss.

Rotter, J. B. (1955). The role of the psychological situation in determining the direction of human behavior. In M. R. Jones (Ed.), *Nebraska Symposium on Motivation* (pp. 245–268). Lincoln: University of Nebraska Press.

Russell, R. W. (1970). "Psychology." Noun or adjective. *American Psychologist, 25,* 211–218.

Rutter, M. (1988). *Studies of psychosocial risk: The power of longitudinal data.* Cambridge, England: Cambridge University Press.

Rutter, M. (2004). Pathways of genetic influences on psychopathology. *European Review, 12,* 19–33.

Rutter, M., & Casaer, P. (1991). *Biological risk factors for psychosocial disorders.* Cambridge, England: Cambridge University Press.

Ryff, C. D. (1987). The place of personality and social structure research in social psychology. *Journal of Personality and Social Psychology, 53,* 1192–1202.

Sameroff, A. J. (1983). Developmental systems: Context and evolution. In P. H. Mussen (Gen. Ed.) & W. Kessen (Vol. Ed.), *Handbook of child psychology: Vol. 1. History, theory, and methods* (4th ed., pp. 237–294). New York: Wiley.

Sameroff, A. J. (1989). Commentary: General systems and the regulation of development. In M. R. Gunnar & E. Thelen (Eds.), *Systems and development* (pp. 219–235). Hillsdale, NJ: Erlbaum.

Sameroff, A. J., & MacKenzie, M. J. (2003). Research strategies for capturing transactional models of development: The limits of the possible. *Development and Psychopathology, 15,* 613–640.

Sameroff, A. J., Peck, S. C., & Eccles, J. S. (2004). Changing ecological determinants of conduct problems from early adolescence to early adulthood. *Development and Psychopathology, 16,* 873–896.

Sanford, N. (1965). Will psychologists study human problems? *American Psychologist, 20,* 192–202.

Sapolsky, R. M. (1990). Stress in the wild. *Scientific American, 262,* 106–113.

Sapolsky, R. M. (1994). On human nature. *The Sciences, 34*(6), 14–16.

Sapolsky, R. M. (2005). The influence of social hierarchy on primate health, *Science, 308,* 648–652.

Sarbin, T. R. (1986). The narrative as the root metaphor for psychology. In T. R. Sarbin (Ed.), *Narrative psychology: The storied nature of human conduct* (pp. 3–21). New York: Praeger.

Sarigiani, P. A., Wilson, J. L., Petersen, A. C., & Vicary, J. R. (1990). Self-image and educational plans of adolescents from two contrasting communities. *Journal of Early Adolescence, 10,* 37–55.

Schaie, K. W., & Baltes, P. B. (1975). On sequential strategies in developmental research: Description or explanation? *Human Development, 128,* 384–390.

Schneider, W., & Edelstein, W. (1990). *Inventory of European Longitudinal Studies in the Behavioural and Medical Sciences.* Berlin, Germany: Max-Planck-Institute for Human Development and Education.

Schneirla, T. C. (1957). The concept of development in comparative psychology. In D. B. Harris (Ed.), *The concept of development* (pp. 78–108). Minneapolis: University of Minnesota Press.

Schneirla, T. C. (1959). An evolutionary and developmental theory of biphasic processes underlying approach and withdrawal. In *Nebraska Symposium on Motivation.* Lincoln: University of Nebraska.

Schneirla, T. C. (1966). Behavioral development and comparative psychology. *Quarterly Review of Biology, 41,* 283–302.

Schrott, L. M. (1997). Effect of training and environment on brain morphology and behavior. *Acta Pediatrica*(Suppl. 42), 45–47.

Schwartz, C. (1987). Personality and the unification of psychology and modern physics: A system approach. In J. Aronoff, A. I. Robin, & R. A. Zucker (Eds.), *The emergence of personality* (pp. 217–254). New York: Springer.

Schwartz, N. (2000). Emotion, cognition, and decision making. *Cognition and Emotion, 14*(41), 433–440.

Schweder, R. A., Goodnow, J., Hatano, G., LeVine, R. A., Markus, H., & Miller, P. (1998). In W. Damon (Editor-in-Chief) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 865–937). New York: Wiley.

Scriven, M. (1959). Explanation and prediction in evolutionary theory. *Science, 130,* 77–482.

Segalowitz, S. J., & Schmidt, L. A. (2003). Developmental psychology and neurosciences. In J. Valsiner & K. J. Conolly (Eds.), *Handbook of developmental psychology* (pp. 48–71). London: Sage.

Seligman, M. E. P. (1975). *Helplessness: On depression, development and death.* San Francisco: Freeman.

Sells, S. B. (1963). *Stimulus determinants of behavior.* New York: Ronald Press.

Sells, S. B. (1966). Ecology and the science of psychology. *Multivariate Behavioral Research, 1,* 131–144.

Selye, H. (1976). *Stress in health and disease.* Boston: Butterworths.

Shanahan, M. J., Valsiner, J., & Gottlieb, G. (1997). Developmental concepts in cross-disciplinary comparison. In J. Tudge, M. J. Shanahan, & J. Valsiner (Eds.), *Comparisons in human development: Understanding time and context* (pp. 34–71). New York: Cambridge University Press.

Shannon, L. W. (1988). *Criminal career continuity.* New York: Human Sciences Press.

Shinn, M. W. (1900). *The biography of a baby.* New York: Houghton Mifflin.

Silbereisen, R. K. (1995, May). *Early adversities and psychosocial development in adolescence: A comparison of the former Germanies.* Paper presented at the Research Colloquium "Growing up in times of social change," Friedrich Schiller University of Jena, Germany.

Silbereisen, R. K., & Kracke, B. (1997). Self-reported maturational timing and adaptation in adolescence. In J. Schulenberg, J. L. Maggs, & K. Hurrelman (Eds.), *Health risks and developmental transitions during adolescence* (pp. 85–109). London: Cambridge University Press.

Silbereisen, R. K., Meschke, L. L., & Schwarz, B. (1996). Leaving parents' home: Predictors of home leaving age in young adults raised in former East and West Germany. In J. A. Graber & J. S. Dubas (Ed.), *Leaving home: Understanding the transition to adulthood (New directions in child development)* (pp. 71–86). San Francisco: Jossey Bass.

Silbereisen, R. K., & Noack, P. (1988). On the constructive role of problem behaviors in adolescence. In N. Bolgar, A. Caspi, G. Downey, & M. Moorehouse (Eds.), *Persons in developmental processes* (pp. 152–180). New York: Cambridge University Press.

Singer, M. I., Slovak, K., Frierson, T., & York, P. (1998). Viewing preferences, symptoms of psychological trauma, and violent behaviors among children who watch television. *Journal of the American Academy of Child and Adolescent Psychiatry, 37,* 1041–1048.

Smith, C. A., & Lazarus, R. S. (1990). Emotion and adaptation. In L. Pervin (Ed.), *Handbook of personality* (pp. 609–637). New York: Guilford Press.

Solomon, R. L., & Corbit, J. D. (1974). An opponent theory of motivation: Vol. I. Temporal dynamics of affect. *Psychological Review, 2,* 119–145.

Spear, L. P. (2000). Neurobiological changes in adolescence. *Current Directions in Psychological Science, 9,* 111–114.

Spring, B., & Coons, H. (1982). Stress as a precursor of schizophrenia. In R. W. J. Neufeld (Ed.), *Psychological stress and psychopathology.* New York: McGraw-Hill.

Sroufe, L. A. (1979). The coherence of individual development: Early care, attachment and subsequent developmental issues. *American Psychologist, 34,* 834–841.

Stattin, H., Janson, H., Klackenberg-Larsson, I., & Magnusson, D. (1995). Corporal punishment in everyday life: An intergenerational perspective. In J. McCord (Ed.), *Coercion and punishment in long-term perspectives* (pp. 315–347). New York: Cambridge University Press.

Stattin, H., & Kerr, M. (2002). Adolescents' values matter. In J.-E. Nurmi (Ed.), *Navigating through adolescence: European perspectives* (Michigan State University Series on Families and Child Development, pp. 21–58). New York: Routledge.

Stattin, H., Kerr, M., Johansson, T., & Ruiselova, Z. (in press). *Female pubertal timing and problem behavior in adolescence: Explaining the link.*

Stattin, H., & Klackenberg, G. (1992). Family discord in adolescence in the light of family discord in childhood: The maternal perspective. In W. Meeus, M. de Goede, W. Kox, & K. Hurrelman (Eds.), *Adolescence, careers, and cultures* (pp. 143–161). Berlin, Germany: de Gruyter.

Stattin, H., & Magnusson, D. (1990). Pubertal maturation in female development. In D. Magnusson (Vol. Ed.), *Paths through life* (Vol. 2). Hillsdale, NJ: Erlbaum.

Stattin, H., & Magnusson, D. (1995). Onset of official delinquency: Its co-occurrence in time with educational, behavioral and interpersonal problems. *British Journal of Criminology, 35,* 417–449.

Stattin, H., & Magnusson, D. (1996). Antisocial behavior: A holistic perspective. *Development and Psychopathology, 8,* 617–645.

Stein, M. B., Goldin, P. R., Sareen, J., Eyler Zorilla, L. T., & Brown, G. G. (2002). Increased amygdala activation to arranged and contemptuous faces in generalized social phobia. *Archives of General Psychiatry, 59,* 1027–1034.

Steinberg, L. (1987). Latchkey children and susceptibility to peer pressure: An ecological analysis. *Developmental Psychology, 22,* 433–439.

Stern, D. C. (2001). Initial patterning of the central nervous system: How many organizers? *Nature Reviews: Neuroscience, 2,* 92–98.

Stern, W. (1914). *Psychologie der frühen Kindheit* [Psychology in early childhood]. Leipzig, Germany: Quelle & Meyer.

Stern, W. (1927). *Psychologie der frühen Kindheit* [Psychology in early childhood]. Leipzig, Germany: Quelle und Meyer. (Original work published 1914)

Stern, W. (1935). *Allgemeine Psychologie auf personalistischer Grundlage.* Den Haag: Nijhoff.

Sternberg, P. W. (2004). A pattern of precision. *Science, 303*(5658), 637–638.

Sternberg, R. J. (2004). Culture and intelligence. *American Psychologist, 59*(5), 325–338.

Stryker, M. P. (1994). Precise development from imprecise rule. *Science, 263,* 1244–1245.

Stumpf, C. (1883). *Tonpsychologie* (Vol. 1). Leipzig, Germany: S. Hirzel.

Susman, E. J. (1993). Psychological, contextual, and psychobiological interactions: A developmental perspective on conduct disorder: Toward a developmental perspective on conduct disorder [Special issue]. *Development and Psychopathology, 5,* 181–189.

Susman, E. J. (1998). Biobehavioral development: A integrative perspective. *International Journal of Behavioral Development, 22,* 671–679.

Tanner, J. M. (1981). *A history of the study of human growth.* Cambridge, England: Cambridge University Press.

Tetens, J. N. (1777). *Philosophische Versuche ber die menschliche Natur und ihre Entwicklung.* Leipzig, Germany: Weidmanns Eben und Reich.

Thelen, E. (1981). Kicking, rocking, and waving: Contexual analysis of rhythmical stereotypes in normal human infants. *Animal Behaviour, 29,* 3–11.

Thelen, E. (1995). Motor development: A new synthesis. *American Psychologist, 50,* 79–95.

Thomae, H. (1979). The concept of development and life-span developmental psychology. In P. B. Baltes & O. G. Brim Jr. (Eds.), *Life-span development and behavior* (Vol. 2., pp. 281–312). New York: Academic Press.

Thomas, W. I. (1927). The behavior pattern and the situation: Publications of the American Sociological Society. *Papers and Proceedings, 22,* 1–13.

Thomas, W. I. (1928). *The child in America.* New York: Knopf.

Thompson, R. A. (2001). Infancy and childhood: Emotional development. In N. J. Smelzer & P. B. Baltes (Eds.), *International encyclopedia of the social and behavioral sciences* (pp. 7382–7387). Amsterdam: Elsevier.

Thompson, S. C. (1981). Will it hurt less if I can control it? A complex answer to a simple question. *Psychological Bulletin, 90,* 89–101.

Tobach, E., & Schneirla, T. C. (1968). The biopsychology of social behavior of animals. In R. E. Cooke & S. Levin (Eds.), *Biological basis of pediatric practice* (pp. 68–82). New York: McGraw-Hill.

Tolman, E. C. (1951). A psychological model. In T. Parsons & E. A. Shils (Eds.), *Toward a general theory of action* (pp. 279–364). Cambridge, MA: Harvard University Press.

Tomasello, M. (1999). *The cultural origin of human cognition.* Cambridge, MA: Harvard University Press.

Tomkins, S. (1979). Script theory: Differential magnification of affects. In H. Howe & R. Dienstbier (Eds.), *Nebraska Symposium on Motivation* (Vol. 26, pp. 201–236). Lincoln: University of Nebraska Press.

Tononi, G., & Edelman, G. M. (1998). Consciousness and complexity. *Science, 282,* 1846–1851.

Törestad, B., Olah, A., & Magnusson, D. (1989). Individual control, intensity of reactions and frequency of occurrence: An empirical study of cross-culturally invariant relationships. *Perceptual and Motor Skills, 68,* 1339–1350.

Tracy, J. L., & Robins, R. W. (2004). Keeping the self in self-conscious emotions: Further arguments for a theoretical model. *Psychological Inquiry, 15,* 171–177.

Trevarthen, C., & Aitken, J. K. (2001). Infant intersubjectivity: Research, theory, and clinical applications. *Journal of Child Psychology and Psychiatry, 42*(1), 3–48.

Uvnäs-Moberg, K. (1998a). Oxytocin may mediate the benefits of positive social interactions uzguris and emotions. *Psychoneuroendrocrinology, 23,* 819–825.

Uvnäs-Moberg, K. (1998b). Antistress pattern induced by oxytocin. *News in Physiological Sciences, 13,* 22–26.

Uvnäs-Moberg, K., Arn, I., & Magnusson, D. (2005). The psychology of emotion: The role of the oxytonergic system. *International Journal of Behavioral Medicine, 12*(2), 59–65.

Vallacher, R. R., & Nowak, A. (1994). *Dynamical systems in social psychology.* San Diego, CA: Academic Press.

Valsiner, J., & Connolly, K. J. (Eds.). (2003). *Handbook of developmental psychology.* London: Sage.

Valsiner, J., & Lawrence, J. A. (1996). Human development in culture across the life-span. In J. W. Berry, P. R. Dasen, & T. S. Saraswathi (Eds.), *Handbook of cross-cultural research* (pp. 2–67). New York: Allyn & Bacon.

van Geert, P. (1998). A dynamic systems model of basic developmental mechanisms: Piaget, Vygotsky, and Beyond. *Psychological Review, 105*(4), 734–677.

von Bertalanffy, L. (1968). *General system theory.* New York: Braziller.

von Eye, A. (2002). *Configural frequency analysis: Methods, models, applications.* Mahwah, NJ: Erlbaum.

von Eye, A., & Bergman, L. R. (2003). Research strategies in developmental psychopathology: Dimensional identity and the person-oriented approach. *Development and Psychopathology, 15,* 553–580.

von Eye, A., & Kreppner, K. (1989). Family systems and family development: The selection of analytical units. In K. Kreppner & R. M. Lerner (Eds.), *Family systems and life-span development* (pp. 247–269). Hillsdale, NJ: Erlbaum.

Vygotsky, L. (1978). *Mind in society: The development of higher psychological processes.* Cambridge, MA: Harvard University Press.

Wachs, T. D. (1977). The optimal stimulation hypothesis and early development: Anybody got a match. In I. C. Uzgiris & F. Weizmann (Eds.), *The structuring of experiences* (pp. 153–178). New York: Plenum Press.

Waddington, C. (1962). *New patterns in genetics and development.* New York: Columbia.

Wapner, S., & Kaplan, B. (1983). *Toward a holistic developmental psychology.* Hillsdale, NJ: Erlbaum.

Warburton, D. M. (1979). Physiological aspects of informational processing and stress. In V. Hamilton & D. M. Warburton (Eds.), *Human stress and cognition* (pp. 33–66). Chichester, England: Wiley.

Watson, J. B. (1913). Psychology as the behaviorist views it. *Psychological Review, 20,* 158–177.

Watson, J. B. (1930). *Behaviorism* (2nd ed.). New York: Norton.

Weiner, H. (1989). The dynamics of the organism: Implications of recent biological thought for psychosomatic theory and research. *Psychosomatic Medicine, 51,* 608–635.

White, R. W. (1959). Motivation reconsidered: The concept of competence. *Psychological Review, 66,* 297–333.

Wills, C. (1993). Which came first? Nature, nurture and the tangible history of human development. *The Sciences, 33,* 38–43.

Wohlwill, J. F. (1973). *The study of behavioral development.* London: Academic Press.

Wolff, P. H. (1981). Normal variation in human maturation. In K. J. Conolly & H. F. R. Prechtl (Eds.), *Maturation and development: Biological and psychological maturation.* London: Heinemann Medical Books.

Wundt, W. (1948). Principles of physiological psychology. In W. Dennis (Ed.), *Readings in the history of psychology* (pp. 248–250). New York: Appleton-Century Crofts.

CHAPTER 9

The Developing Person: An Experiential Perspective

KEVIN RATHUNDE and MIHALY CSIKSZENTMIHALYI

AN EXPERIENTIAL PERSPECTIVE ON HUMAN DEVELOPMENT 465
An Experiential Turn: Putting the Study of Experience in Historical Context 466
The Developing Person in Context 468
Human Nature and Optimal Arousal 469
Instigating One's Own Development: The Potential Self-Regulation of Experience 471
Ideal Outcomes of Adult Development: The Role of Psychological Complexity 472
OPTIMAL EXPERIENCE THEORY 474
A Phenomenological Extension of Piaget 474
Other Perspectives on Self-Environment Equilibrium 476
The Optimal Experience of Flow 477
Flow and Development 479
Psychological Complexity and Development 480
EXAMPLES OF COMPLEXITY IN LATER LIFE 482
Dimensions of Complexity 484
Dialectical Thinking and Optimal Experience 489
Complexity and Wisdom 491
THE FOUNDATIONS OF COMPLEXITY IN CHILD DEVELOPMENT 493
The Importance of Social Context 494
Parent-Child Interaction and the Growth of Complexity 496
Teacher-Child Interaction and the Growth of Complexity 501
NEOTENY AND COMPLEXITY: THE EVOLUTIONARY LOGIC OF UNENDING CHILDHOOD 506
The Syntelic Character of Play 507
CONCLUSIONS: THE ROLE OF EXPERIENCE IN DEVELOPMENT 509
REFERENCES 510

AN EXPERIENTIAL PERSPECTIVE ON HUMAN DEVELOPMENT

Human development is viewed through an experiential lens in this chapter. Experiential or phenomenological perspectives are underutilized in developmental thought, despite the fact that they can reveal much about the process of development. In particular, optimal experience and its regulation can help explain why some individuals are able to maintain cognitive flexibility throughout life and are better able to navigate a path of lifelong learning. A better understanding of these person-level processes can also shed light on the characteristics of social contexts that positively affect experience and, therefore, the course of development.

Phenomenological analyses tend to be descriptive and not focused on the developmental process. There are also numerous methodological and theoretical difficulties involved in studying subjective experience (Giorgi, 1985). For these reasons, many researchers have not considered an experiential approach feasible for exploring developmental questions. However, what a person feels and reports during an activity is one of the few ways of discovering how efficiently an individual focuses energy and attention at the moment. And understanding the use of attention is one of the most valuable levels of analysis for exploring the development of a person, especially as it relates to the acquisition of psychic resources, or education broadly defined.

Adopting an experiential perspective in no way implies taking the person out of context. Nor does it suggest that individual processes are more important than biological or cultural ones. Although receiving a privileged interpretive position in this chapter, studying subjective experience is compatible with many contemporary theories of human development. Like these, we assume that a person can actively affect the course of development, but that development emerges from the

interrelations of biological, psychological, and sociocultural forces (Lerner, Chapter 1, this *Handbook,* this volume). To avoid any misunderstanding on these points, it is useful to begin the chapter by briefly articulating a few of our assumptions about experience and the developing person and suggesting how these assumptions fit with other contemporary theories.

An Experiential Turn: Putting the Study of Experience in Historical Context

There are many difficult and provocative questions implicit in the study of experience and its ramifications for the scientific study of the person. What is the nature of experience and consciousness? Can first-person, subjective data be reconciled with objective, third-person techniques? Are the data reliable or hopelessly biased? How does a phenomenological method challenge the traditional assumptions of experimental science? What is the best method for systematically exploring subjective experience? None of these questions are dealt with at length in this chapter, although our position on some of them becomes clear while exploring other topics (for a discussion of these methodological and epistemological issues, see Chalmers, 1995; Rathunde, 2001c; Taylor & Wozniak, 1996; Varela, Thompson, & Rosch, 1991). Nevertheless, it is useful to take time to put the study of experience in historical context.

William James did much to establish the relevance of subjective experience for psychology. James's interest in experience and its relation to optimal functioning were unique for his time. He initiated what might be considered an experiential turn in U.S. psychology that laid the foundation for current work in a number of related areas. For example, one of his most important achievements was linking immediate experience and relatively permanent mental structures. "Only those items which I notice shape my mind," he said, "without selective interest, experience is an utter chaos" (James, 1890, p. 402). This statement signals James's inclusive and holistic view of consciousness and his attempt to understand how immediate interests and emotions affected the ongoing stream of thought. His stream-of-thought metaphor highlighted the crucial importance of understanding the moment-to-moment use of attention as a foundation for understanding many other outcomes, such as lifelong learning, and even genius.

The experiential turn initiated by James resulted from his interests in the stream of experiencing and the human being as an experiencing agent (Taylor & Wozniak, 1996). This underlying focus distinguished his work and integrated his many areas of inquiry. Other psychologists writing at the time tended to remove outcomes and behaviors from the stream of experience, reify them, and set them off as objective facts in contrast to a murky subjective realm. James's epistemological approach of radical empiricism (Taylor & Wozniak, 1996) did not operate in this dualistic fashion. He understood the constant interplay of subjective and objective content in the stream of thought; what was taken to be objective at one point in time was subjective at another, and vice versa.

James's (1902) research on exceptional mental states and transcendent/religious experiences was also important for the foundation of an experiential perspective and for topics that are discussed later in this chapter (e.g., deeply engaging or "optimal experiences"). Unlike many other psychologists, James did not discount such experiences because he believed they could be a primary source of energy that stimulated optimal human functioning. In a presidential address entitled "The Energies of Men" that was delivered before the American Philosophical Association at Columbia University in 1906 (James, 1917, pp. 40–57), James considered why some individuals "live at their maximum of energy." He posed two questions: (1) What were the limits of human energy, and (2) how could this energy be stimulated and released, so it could be put to optimal use? He noted that these questions sounded commonplace, but added: "As a methodological program of scientific inquiry, I doubt whether they have ever seriously been taken up. If answered fully, almost the whole of mental science and the science of conduct would find a place under them" (p. 44).

Another key thinker in the experiential turn of American psychology was John Dewey. If James set the focus on the use of attention and energy, Dewey applied such a perspective most consistently to the developing person, especially in regards to education and lifelong learning (Rathunde, 2001c).

That Dewey was a phenomenological thinker is undeniable. Like James, his methodological approach shunned dualistic and positivistic approaches. Kestenbaum (1977) notes, "For his entire philosophic career, Dewey in one way or another was brought back to this realization that subject and object, self and world, cannot be specified independently of each other. His conception of organic interaction, and later his conception of

transaction, were attempts to capture the reciprocal implication of self and world in every experienced situation" (p. 1). There is a phenomenological sense to all of Dewey's thought because meanings must be "had" before they could be "known" in reflection and knowledge. Ideas were not simply generalizations based on objectively observed facts, nor were they images or copies of external objects; instead, they were functional in that they helped to organize the world rather than replicate it. Dewey conceived ideas as tools for transforming the uneasiness of experienced problems. Rational processes, therefore, could suggest a solution to a problem and a goal, but if the goal became an end in itself and was disconnected from the stream of experience, it corrupted energy, attention, and development.

This basic postulate of Dewey is key to understanding one of the most important points in this chapter: Intrinsic motivation provides an invaluable and continually renewable source of energy for development. Intrinsic motivation, as conceptualized here, is not another instance of dichotomizing inner and outer as is sometimes the case with intrinsic versus extrinsic motivation debates. Rather, intrinsic motivation can be thought of as the energy that results when momentary involvement and goals are not artificially or forcefully divorced from one another. Dewey often relied on dialectical terminology (e.g., synthesis-analysis, concrete-abstract, and subjective-objective) to illustrate the healthy interrelation or tension of such motivated thinking (Dewey, 1933). He often described a rhythm between complementary opposites such that one pole emphasized a mode of immediate participation or a feeling of being wrapped up in an activity, and the other pole corresponded to a distancing from momentary involvement to assess the directionality of the learning process. Such a contrast in consciousness furnished essential feedback allowing spontaneous involvement to stay on track toward a valued goal (see also Kolb, 1984; Rathunde, 1996, 2001a).

The part of the dialectic that is overlooked by many psychologists is immediate experience. Much of the seminal work of phenomenologists such as Husserl (1960) and Merleau-Ponty (1962), in contrast, has focused on this prereflective experiencing that is embedded in the stream of consciousness and, therefore, difficult to describe. If such immediacy is not considered in relation to consciously pursued goals, it is very difficult to understand the motivational forces behind them. Dewey understood this, as did James. It was the primary reason that Dewey devoted so much time to understanding the relation of education and experience (1938). He believed that education must not ignore the importance of momentary, unfolding experience. That is why Dewey stressed the interplay of thinking and doing in the classroom; rationality was a problem-solving tool best used in coordination with action. In contrast, traditional educational approaches—still predominant today—often promote a decontextualized, fact-based approach to knowledge that is not sensitive to the quality of students' ongoing experience. We return to this theme later in the chapter when attempting to understand the role of social contexts in promoting optimal experience.

A key point in this chapter is that optimal experiences, or states of highly focused and intense engagement, reveal the times when—in James's words—a person "lives at their maximum of energy." The developmental importance of such times lies in the momentum they make available for growth. Western and Eastern thought and literature are full of allusions to extraordinary states of experience that can serve as turning points on one's life path. James, for example, approached optimal experience in terms of mysticism and religion. Whereas, for Dewey (1934/1980), aesthetic experiences served as the primary example of intensified states of experience that revealed the optimal use of energy. "Dewey considered aesthetic experience as a realization of the possibilities of ordinary, common, nonaesthetic experience" (Kestenbaum, 1977, p. 9). Aesthetic experiences could reveal a great deal about human potential and the ideal conditions for learning.

In contemporary psychology, Abraham Maslow (1968) was instrumental in highlighting how such "peak" experiences were related to optimal growth in self-actualizing individuals. Maslow—like Dewey and James before him—grounded his thought in a philosophy that challenged traditional scientific approaches. Maslow's grounding came from the tradition of existentialism as well as phenomenology. Self-actualizing individuals were on a path of lifelong learning; as one might expect, they reported more peak experiences than individuals who were stuck in lower phases of growth. Peak experiences could occur in any domain of life, but Maslow tended to view them, like James, as rare, transcendent moments that could have life-changing consequences.

The approach in the present chapter continues the turn toward experience. However, one important difference is to view optimal experiences, hereafter also referred to as *flow experiences* (Csikszentmihalyi, 1975,

1990), as more widely available and integrated with daily life. Flow can accompany a life event of singular importance, but it can also occur in the context of seemingly ordinary daily activities. The research on flow that has emerged over that last 30 years introduces a distinct focus on daily life and development, especially the development of a person's skills in creative and educational endeavors. Another difference from past approaches is in the nature of the empirical research that has been conducted. In addition to the use of first person, narrative accounts that have historically been used in research on optimal experience, one of the distinguishing features of research on flow has been the use of the Experience Sampling Method (ESM). The ESM uses electronic paging devices (e.g., programmed watches) to randomly signal study participants and prompt them to record their immediate experience and thoughts. Such a method of "systematic phenomenology" blends qualitative and quantitative information in a unique way and is currently used in a wide variety of research fields (Hektner & Schmidt, in press). Findings from several ESM studies are used in the chapter to illustrate how an experiential approach can shed light on the developing person.

The Developing Person in Context

The great extent to which human development is embedded in biosocial and cultural contexts, an insight that has increasingly taken hold in developmental thought over the past several decades, is a fundamental component of phenomenological thinking (Brandtstädter, Chapter 10; Bronfenbrenner & Morris, Chapter 14; Elder & Shanahan, Chapter 12; Lerner, Chapter 1; Magnusson & Stattin, Chapter 8, this *Handbook,* this volume; Nakamura & Csikszentmihlayi, 2003). Phenomenologists emphasize how much is taken-for-granted and not explicitly conscious in a person's experience: Again, much of life is "had" or given in immediate experience before it is "known" in conscious thought (Damasio, 1994). Merleau-Ponty emphasized the omnipresent influence of the body on perception. Dewey noted the pervasive influence of social contexts reflected in the preobjective habits that informed a person's life (Kestenbaum, 1977). The perspective in this chapter is that with increasing age and wisdom, a person can wield significant self-regulative control over their attention, experience, and growth. However, before discussing a person's capacity to actively influence their own development, it is important to make clear the high degree to which a person's attention is rooted in their physical and social circumstances.

Each community develops an image of what constitutes a "good" person and what qualities and skills are important to develop to be a valued member of a group. For example, the traditional Hindu view is that a person is not an individual, but a position in a network of social relations (Marriott, 1976). A physical specimen of *Homo sapiens* is not a person, unless he or she belongs to a group, and fulfills the responsibilities thereof. The classical Chinese view and the understanding of the native tribes living along the Amazon River are not that different (Lévi-Strauss, 1967). In most cultures, the individual in its physicality is no better than any other animal. It takes the transforming power of culture and society to turn the animal into a person.

Different cultures use different techniques for making sure that children acquire the knowledge, behavior, and emotions that will enable them to function appropriately as adults. This process of socialization is often informal, enforced by the constant pressure of public opinion. But most cultures evolve formal mechanisms of socialization, often reinforced by complex rituals and ceremonies. India provides some of the clearest examples of this process. The classical Hindu culture has taken great pains to make sure that from infancy to old age its members conform to appropriate ideals of behavior. "The Hindu person is produced consciously and deliberately during a series of collective events. These events are *samskaras,* life cycle rituals that are fundamental and compulsory in the life of a Hindu" (Hart, 1992, p. 1). Samskaras help to shape children and adolescents by giving them new "rules of conduct" for each successive step in life (Pandey 1969, p. 32). As the Indian psychoanalyst Sadhir Kakar (1978) wrote half facetiously, "Samskaras mean 'the right rite at the right time.' . . . The conceptualization of the human life cycle unfolding in a series of stages, with each stage having its unique 'tasks' and the need for an orderly progression through the stages, is an established part of traditional Indian thought . . . one of the major thrusts of these rituals is the gradual integration of the child into society, with the samskaras, as it were, beating time to a measured movement that takes the child away from the original mother-infant symbiosis into the full-fledged membership of his community" (pp. 204–205).

Rites of passage certify that a child or young adult is ready to enter the next stage of personhood, until he or

she grows old and has played every possible role that is available in the community. In some cultures, a man or woman is not considered a full-fledged person until their first grandchild is born. Being a grandparent means, among other things that: (a) one is fertile, and therefore endowed with sacred power; (b) one is successful, because only reasonably wealthy parents can find spouses for their children; and (c) one is wise or at least experienced, having lived this long (LeVine, 1980). Only when these qualities are finally achieved is a person finally complete.

In Western societies, transitions to higher levels of personhood are no longer well marked, except in terms of educational progress, where various graduation ceremonies punctuate one's academic career. Religious progress, marked by such ceremonies as the Jewish bar mitzvah and the Catholic sacrament of confirmation, are bare vestiges of the importance that the spiritual formation of personhood had in the Judeo-Christian tradition. But even though we no longer have clearly marked transition points to higher levels of personhood, we do expect, in our society also, different qualities from people at different stages of life.

So while we lack communal rites to celebrate a person's passage from one stage to another, developmental psychologists recognize the importance of such transitions in their descriptions of the life cycle. For instance, Eric Erikson (1950) focuses on the sequence of psychosocial tasks we must confront: Forming an identity in adolescence, developing intimacy in young adulthood, achieving generativity in middle age, and finally bringing together one's past life into a meaningful narrative at the stage of integrity in old age (see also Vaillant, 1993). Robert Havighurst (1953) shifted the emphasis more on social role demands, and developed a model of life transitions based on changing expectations related to age—for example, the student, the worker, the parent. More recently, Levinson (1980) and Bee (1992) proposed similar models. Developmental theories usually do not make the claim that these tasks are always resolved, or even that the person is necessarily aware of them. But unless they are successfully resolved, the person's psychological adaptation is likely to be impaired. Common to these models is the assumption that individuals who deviate from normative developmental stages without good reason run the risk of compromising their chances for full personhood.

Stressing the ways in which a person is socially constructed and embedded in their social contexts seems to imply a passive and relativistic position. It may suggest that the criteria of personhood are more or less arbitrary, the *result* of chance historical developments in different places and times. It may also suggest that most aspects of life are "unconscious" and not subject to a person's active influence. However, we do not believe these statements to be true. The understanding of how a person develops may vary a great deal across times and places, and social practices may place powerful constraints on paths to becoming a person. However, adopting an experiential perspective highlights core aspects of human nature that—if nurtured and allowed to flourish—provide opportunities to exert influence on the course of development.

Human Nature and Optimal Arousal

One key aspect of human nature that is similar across cultures is the need for optimal arousal. Decades of research on "approach/withdrawal" theory (Tobach & Schneirla, 1968) and "optimal arousal" theory (Apter, 1989; Berlyne, 1960; Hebb, 1955) illustrate that there are common human responses evoked by a person's arousal level, and these responses start in early infancy (Turkewitz, Gardner, & Lewkowicz, 1984). Optimal arousal is genetically based and transcultural. It has presumably emerged during the evolution of humankind because it is adaptive and has been useful in assisting human development, especially in negotiating a person-environment fit that is effective and rewarding.

On one end of the arousal continuum are experiences such as anxiety and fear, which have obvious implications for safety and survival. Such high arousal conditions elicit responses that attempt to reduce arousal to manageable levels (e.g., withdrawal). On the other end of the spectrum are low arousal conditions, such as boredom, that elicit a less obvious but equally important response—attempts to increase arousal (e.g., approach, exploration, play). The focus in this chapter is primarily on the optimal arousal of flow, the axis of this arousal continuum. Because all experiences are situated in contexts, the exact nature of anxiety, boredom, and flow will differ with respect to specific content. In other words, cultures have different symbolic domains, and because they organize information differently, there are many differences in what activities are likely to produce flow, and what specific steps constitute the most effective path to it. However, numerous, cross-cultural studies of flow (Csikszentmihalyi, 1975, 1990; Nakamura &

Csikszentmihalyi, 2002) suggest that there is a remarkable consistency in the experiential process and the phenomenological state.

To understand the developing person from an experiential perspective, one could start from other common human experiences besides flow. However, there are certain advantages in focusing on optimal arousal, especially when a primary goal is to understand the developing person. Anxiety ignites a conservative response (e.g., caution, consolidation of a position); it motivates because of the need to protect things that are thought to be essential, such as one's life, family, or beliefs. Conditions of low arousal, like boredom, spark an opposite movement. Such experiences can motivate exploration and can have a liberating or diversifying effect on a person's attention. Both of these aversive states, of course, do not always prompt responses that "solve" a problem in a way that promotes growth and leads to optimal arousal. The highly anxious person may fail to take risks that truly solve a problem and may opt, instead, for a short-term solution that manages stress (e.g., accepting the safety of the status quo). And to the extent that boredom turns into contentment or a desire for distraction and entertainment, it can also stall meaningful growth. In this case, the developmental impasse is due to a weakened focus of attention and a foolish waste of energy.

The experience of flow occupies a unique place on this experiential continuum and represents a healthy solution to the problems of boredom and anxiety. When it is unfolding, flow manifests an optimal combination of order and novelty; it represents the coordinated operation of stabilizing and broadening uses of attention (Fredrickson, 1998). In terms of the flow model (described in more detail later in the chapter), this combination is represented by the constructs of skill and challenge: Flow occurs more often when a person's skills and challenges are similarly strong and potent. In such conditions, skills are being transformed by the new challenges a person engages, and challenges are being transformed by the application and expansion of skills. Flow is a more difficult way forward as a solution to boredom and anxiety than the short-term solutions of distraction or retreat. The flow experience, therefore, provides a valuable window for viewing the developing person because of its status as a complex experience, or one that lies at the very "edge" of stability and change (Waldrop, 1992). This combination leads to that distinctive phenomenological state wherein one feels a sense of being in control, but in circumstances one has never faced before. It is in this sense that we think of flow as a full or optimal experience.

The absence of flow also reveals much about the developing person. As with other dialectical models, such as Piaget's (1962) model of assimilation and accommodation, the balance between skills and challenges is thought to be in flux and always changing. To resolve a high arousal condition (i.e., high challenge and low skill) in a way that promotes growth over the long run, a person needs to raise skills and thereby increase a sense of order and emerging control. However, when arousal is reduced in the short-term by disregarding a challenge or holding ever more tightly to the skills already possessed, flow will not occur. Conversely, a healthy solution to boredom (low challenge and high skill) occurs when a person challenges their existing skills and thereby initiates an emerging sense of change and expansion. The short-term solution of finding a distraction, or some form of quick entertainment, may take the sting out of feeling bored, but it will not result in flow. In the long run, such "solutions" are a waste of valuable resources of attention that could be invested in growth-oriented activities. Dewey referred to these unhealthy outcomes as drudgery and fooling, respectively (Dewey, 1913).

The experiential dialectic described here is presumably genetically based and a part of human nature. From a physiological perspective, the human organism is born trying to maintain optimal arousal. Attempts to avoid too much or too little stimulation are apparent from the first moments of life. Therefore, these corrective responses do not depend on the environment for their origination. For example, infants learn through a process of habituation and recovery (Caron & Caron, 1968; Cohen & Younger, 1983). When a novel stimulus is introduced, infants will pay attention until they habituate to the new sight; then, building on the newly formed habit, they will pay attention again when a novel stimulus is introduced. If overstimulated, infants will avert their eyes from a person or object, thereby decelerating their heartbeat and reducing arousal.

Different cultural domains result in thousands of manifestations of optimal arousal and flow. However, the underlying need for optimal arousal, a basic organizing principle of human life, helps to explain the underlying dynamics of these manifestations. We think it helps to explain why works of art with a combination of order and novelty are the most preferred (Arnheim, 1971), why the most performed and loved pieces of music are ones that introduce novelty in a context of familiarity

(Simonton, 1984), and why family conversations that allow for connection and separation of family members are experienced as more enjoyable and interesting (Hauser, 1991; Rathunde, 1997). Each of these situations holds greater potential for optimal arousal because they allow for the intersection of ordering and novelty producing uses of attention. Such situations, therefore, more often result in flow and are intrinsically rewarding.

Instigating One's Own Development: The Potential Self-Regulation of Experience

A major goal in presenting this perspective is to describe the dynamics of optimal experience in enough detail to allow some insight about the potential self-regulation of development. Experience has an important role to play because development unfolds in time and is an emergent phenomenon; moment-to-moment experience, therefore, lies at the very center of this unfolding and provides a holistic level of integration between biology, person, and the cultural environment.

Contemporary theories assessing the significance of biology for human development have moved beyond bottom-up reductionism and have embraced systems views that assert a bidirectional influence between genes and the environment (e.g., Gottlieb, Wahlsten, & Lickliter, Chapter 5, this *Handbook,* this volume). Such approaches suggest that genetic instructions are responsive to the developing organism's external environment, including sensory events and internal neural events. Although systems models acknowledge the importance of psychological phenomena, they are largely focused on observable behavior and not subjective experience as defined in this chapter. Because it is now widely acknowledged that genes, in themselves, do not lead directly to phenotypic traits, an experiential perspective on the developing person would propose that experiences such as flow or interest enter into the bidirectional communications betweens levels in a psychobiological systems view (Gottlieb et al., Chapter 5, this *Handbook,* this volume). This suggestion is consistent with Schneirla's (1959, 1965) observation that the effect of an environmental stimulus depends on the organism's state of arousal and experiential history.

Even if one were to adopt a reductionist view—still common in developmental psychology—that asserts a more fundamental role for genetic activity in producing behavior, an experiential perspective would still be useful for understanding how individuals could maximize their potential given their biological predisposition. The idea of reaction range suggests that there is a constrained set of phenotypes possible for each genotype (Gottesman, 1963). For instance, a person with a genotype that predisposes to introversion is not going to be as outgoing as an extrovert. However, if such a person put himself or herself in the position to have many positive social experiences, it would maximize their orientation toward social engagement. An experiential perspective would emphasize how opportunities for flow in communication and interaction could maximize the range of outgoingness that a particular genotype "allows." A systems view of the same interrelationships would, in theory, provide an even greater role for experience to affect a personality outcome.

Cultural determinism, like biological reductionism, is also being abandoned by most social scientists in favor of systems models that account for the bidirectional influence between persons and social contexts (Lerner, 2002). Again, moment-to-moment experience lies at the heart of emergent person-environment interactions and, therefore, provides a potential leverage point for affecting development and the course of socialization.

Experiential perspectives on the reciprocal influence of person and context have been around for many years, although they have not been organized around a construct of optimal experience. In the first part of the twentieth century, for example, the so-called Chicago school of symbolic interaction (e.g., ideas influenced by George Herbert Mead, William I. Thomas, and Charles H. Cooley) had a strong phenomenological orientation. Thomas and Znaniecki's (1927) *The Polish Peasant in Europe and America* was considered the classic study of the time and a precursor to later attempts to develop a phenomenological alternative to reductionist social science approaches. Symbolic interactionists, through concepts such as Thomas's "definition of the situation," showed how the person-context relationship could not be understood apart from subjective experience and interpretation.

Adding flow as an organizing construct to a phenomenological perspective can further specify how a person is an active influence and not just a passive receptacle of cultural information. Investments of attention are strongly influenced by the subjective quality of experience. Rewarding experiences like flow, for example, attract attention and can affect the selection of biocultural information (Inghilleri, 1999; Massimini & Delle Fave, 2000). In other words, over long periods of time, information and domains that provide opportunities

for flow experience can shape culture through the selection of memes. Similar to biological transmission, the differential transmission of memes in cultural interaction has an eventual impact on the evolution of the culture. To the extent that the self-regulation of optimal experience is possible, individuals can play a conscious role in the way a culture changes.

A person is subject to the socialization forces of a culture, but he or she is capable of initiating change because the opposite is also true: Social practices must accommodate human nature and its parameters for optimal experience. Just as the eye works best by avoiding the extremes of too little or too much illumination, socialization processes will be rejected when they do not provide opportunities for sustaining optimal arousal through transforming anxiety and/or boredom (i.e., by building new skills or finding meaningful challenges, respectively). When social practices consistently result in aversive experiences, or offer only short-term solutions to such experiences, they will not be replicated or endorsed by future generations. Individual actors—through their own self-regulatory actions—will be compelled to change them.

Rigid social practices, for example, authoritarian regimes or unchanging traditional cultures, might survive for a time due to threat of violence, the pressure of public opinion, or the safety and familiarity they provide to a people facing anxiety-provoking threats. However, if such contexts do not provide individuals with opportunities to transform the challenges faced, experience is likely to alternate between anxiety and the deadening of the human spirit resulting from the inflexible "solutions." With time, the quality of life in such contexts works to undermine the stagnant system. Many modern societies face the opposite dilemma: The absence of an external threat and the relative comfort of life have resulted in socialization practices that are geared toward entertainment and distraction rather than growth. Such permissive systems protect the right for self-indulgence, but they provide few opportunities to really challenge the existing order that provides the basis of comfort. Personal experience in such a society can become increasingly frivolous and meaningless. Therefore, pressure for change results from trying to escape the aversive cycle of "solving" the problem of boredom with endless new distractions.

Anxiety that is not effectively resolved through the growth of new skills (i.e., finding a new sense of order) is often resolved by a retreat to the status quo; boredom that is not ameliorated with meaningful challenges is often "treated" with temporary distractions. Both of these undesirable outcomes, if multiplied over time, can result in unhealthy developmental trajectories for societies and the people in them. However, such conditions will not hold in the long run because they waste valuable resources of attention and do allow a person to organize and reorganize experience in increasingly more complex ways. In these aversive social conditions, therefore, the organismic imperative to seek optimal arousal will instigate change. At first, change may come from a "creative minority" of individuals who see a better way forward (Toynbee, 1987). Eventually, however, if a society is to flourish, the forces of stability and change in a society must work in a complementary way, with each used to refashion the other. Simonton's (1984) research on creativity provides some empirical support for this suggestion. Periods of great human achievement and progress often coincide with historical periods where social integration and differentiation were both present, but one did not dominate the other. Later in the chapter a similar reasoning is applied to two important contexts of socialization—schools and families.

Ideal Outcomes of Adult Development: The Role of Psychological Complexity

If optimal experiences like flow indeed signal that the person-environment fit and the developmental process are on a positive trajectory, then one of the most promising areas of research using an experiential perspective is to explore a person's capacity for the self-regulation of optimal experience. To the extent that the dynamics of optimal experience are better understood, it becomes possible to consider how such regulation might unfold. We propose the construct of psychological complexity to refer to an individual's flexible negotiation of experience. Psychological complexity is the self-regulative capacity to move toward optimal experiences by negotiating a self-environment fit that is integrated and differentiated, or a fit that achieves an optimally arousing balance of order and novelty.

Psychological complexity, or more simply—complexity, refers to habitual dispositions that actively respond to aversive experiential conditions: when anxiety indicates disorder in the self-environment relationship, creating order through a higher level of integration becomes a conscious goal; when faced with boredom, seeking change through differentiation becomes the aim. In other words, a person with psychological complexity responds to new challenges with skill-building

attempts, rather than a retreat to familiar methods that alleviate anxiety without transforming the problem that creates it. When facing the opposite experiential impasse, such a person responds to conditions of monotonous ease and comfort by finding a challenge that focuses attention in a transformative direction. Such a change is more than a shortcut to stimulation; it embraces what Piaget would refer to as disequilibrium in the self-environment relationship as a way toward higher development (Piaget, 1962).

Attempts by infants to maintain optimal arousal suggest the early foundations of psychological complexity, and adult interference with these regulation efforts, we believe, creates the first obstacles to the development of complexity as a psychological disposition. However, the notion of psychological complexity is meant to describe mature patterns of self-regulation that are more likely to result with age and experience; our use of the construct here refers to highly developed habits of response that are based in practice and experience. Therefore, the strategy adopted in this chapter is to illustrate how complexity unfolds through the life cycle, beginning with its potential manifestations in later life.

By starting at the end of the life span, and working our way back to childhood, it is easier to recognize patterns that are more likely to result in positive adult regulation and development. Of course, there is still much disagreement about the nature of continuities in development throughout the life span, and even about whether any childhood conditions will lawfully relate to adult conditions. We try not to address such questions, which are amply dealt with in other sections of this volume. Suffice it to say that if perspectives that view the developing person as both active producers and products of their ontogeny are correct, then knowing the desirable endpoints of ontogeny makes it easier to understand how actions earlier in life may enhance the prospects of optimal developmental outcomes.

Despite differences in content across various cultural contexts, across domains of activity, and across points in the life course, and despite the inevitable differences in what will be recognized as constituting "development" and "optimal functioning," we believe it is possible to say something affirmative about optimal adult development. One fruitful direction, we believe, is to look beyond outward appearances and focus on how—within any system—optimal functioning involves the need for integration and differentiation in the self-environment relationship. Psychological complexity can be manifested in many different ways, but there is an underlying similarity in the ups and downs of arousal and the process of negotiating optimal experience. It is reasonable to believe that a person with psychological complexity will more often enjoy the full engagement of attention and optimal arousal that it implies, and will have, therefore, a greater capacity to actualize their potential.

There are compelling reasons to take a position on optimal patterns of development, despite the ambiguity and risk involved. Bruner (1986) has argued that developmental psychologists cannot just *describe,* but must also *prescribe* optimal ways of developing. If not, they abdicate their role in the construction of the public meanings that societies depend on for self-regulation. When such metatheories about the "good man" and the "good society" are explicitly delineated, they not only add to the public dialogue, they also provide a selective principle for determining the nature and direction of developmental research. Rogers (1969) said much the same thing in defense of his conception of the optimal person; he challenged others: "If my concept of the fully functioning person is abhorrent to you . . . then give your definition of the person . . . and publish it for all to see. We need many such definitions so that there can be a really significant modern dialogue as to what constitutes our optimum, our ideal citizen" (p. 296). More recently, Seligman and Csikszentmihalyi (2000) have suggested the same by urging more research be devoted to understanding positive developmental outcomes.

Starting with the fully developed person also allows us to draw from a recent study of creativity in later life in which we describe in detail the mature self-regulation and complexity that potentially characterizes later life. Because physical maturational changes culminate in adolescence, and the periods of middle and late adulthood often are marked by declines in some physical and cognitive skills, theorists have struggled to conceptualize whether adults are in fact "developing," declining, or simply changing (Pearlin, 1982). Our perspective on this debate is similar to Baltes and Smith's (1990) "weak" developmental hypothesis about the possibility of adult development culminating in wisdom. This hypothesis states that increasing age does not necessarily result in wisdom, and that on average older adults may not demonstrate more wisdom than younger ones, but because wisdom is conceptualized as an expertise that requires cumulative practice, and because increasing age provides for more experience and time for such practice, notable outcomes of wisdom will be disproportionately seen in older adults. Likewise, notable manifestations of psychological complexity are more likely to occur in

adulthood, although less developed forms of self-regulation occur at all stages of the life course.

A second reason for starting at the end of the life cycle, therefore, is to facilitate our search for the beginnings of mature self-regulation and complexity in the periods of infancy, childhood, and adolescence. If one first articulates a clearer picture of desirable adult developmental outcomes, then it is easier to search the literature on early developmental periods and, it is hoped, find the connections that link certain patterns in childhood with desirable adult outcomes. We explore in particular the link between psychological complexity and the neotenous development of human children that provides for extended periods of exploration and play (Gould, 1977).

Few would disagree that the ideal outcome for adult development is someone who is fit in body and mind, curious and interested in life, pursuing a vocation with vigor, close to family and friends, helpful and involved in the community, and concerned with making sense of the world. However, different cultures would undoubtedly fill in a different set of outcomes for each of these categories of adult success. Instead of suggesting specific criteria for optimal development, we propose to look through an experiential lens at similarities in the process of regulating experience. Attempts to negotiate optimal experience, and sustain it using the dialectic of integration and differentiation, may look different depending on the symbolic domain under observation, but the dynamics involved are the same and have their basis in optimal arousal and human nature. One of the main tasks in this chapter, therefore, is to explore the self-regulatory skill of turning neutral or adverse everyday situations into engaging experiences.

Before turning to specific examples of psychological complexity, more is said in the next section about optimal experience, complexity, and development. After providing examples of complexity in adulthood, the remaining sections address its antecedents in child and adolescent development. An emphasis is placed on the foundations of complexity in family and school environments.

OPTIMAL EXPERIENCE THEORY

What are the similarities in the process of negotiating optimal experience? How is optimal experience or flow sustained using the dialectic of integration and differentiation? These are some of the questions taken up next. To locate our answers squarely in classical developmental theory, we first explore the notions of optimal experience and psychological complexity in terms made familiar by the early developmental literature, starting with the Piagetian perspective.

A Phenomenological Extension of Piaget

A number of familiar concepts from Piaget's theory are helpful for providing a preliminary understanding of how optimal experience and complexity are related. For instance, *equilibration* expresses a fundamental insight of Piaget: that development is an evolutionary process that exists "between" subject and object. While some theorists before him explained development from the side of the subject (e.g., through a priori structures, rationalism, or other nativist ideas), and others explained it from the side of the environment (e.g., association, positivism, or other nurture perspectives), Piaget tried to solve the riddle of development with an interactionist, open-systems model. Some may find this statement at odds with the too common interpretation of Piaget as a static stage theorist; this misunderstanding, however, arises from his multiple uses of the term *equilibrium.* For instance, it was sometimes used to refer to moment-to-moment adjustments of assimilation and accommodation, sometimes to the temporary accomplishments of the stages, and sometimes to the ideal endpoint of formal operations. It is at the first level of moment-to-moment interactions that Piaget is most clear concerning development as an ongoing relationship between self and environment: assimilation and accommodation are in constant search for equilibrium or balance. Acting in the world continually introduces disequilibrium that must be corrected. It is at also at this level, therefore, that an experiential interpretation of Piaget is best accomplished.

Despite the fact that maturationists and environmentalists both claim a part of his vision, the theory is more accurately understood as derived from an open-systems model of evolutionary biology: "It [Piaget's theory] does not place an energy system within us so much as it places us in a single energy system of all living things. Its primary attention, then, is not to shifts and changes in an internal equilibrium, but to an equilibrium in the world, between the progressively individuated self and the bigger life field, an interaction sculpted by both and constitutive of reality itself" (Kegan, 1982, p. 43). Thus, equilibrium describes the state of the open system such that the self and environment are related in a way

that is differentiated and integrated; to our way of thinking, *such equilibrium would signal optimal arousal.* Assimilation and accommodation are two facets of a unitary and dynamic evolutionary process and must be understood together: As an organism differentiates, it moves, so to speak, through assimilation toward accommodation (i.e., from structure toward change). This movement calls for a reverse movement through accommodation toward assimilation (i.e., from change to structure) that integrates the organism with the environment in a new way.

By describing development in such general systems terms that focus on the relationship between self and environment, some thorny conceptual dichotomies become less troublesome (e.g., nature/nurture), and the person can be seen less as the result of the relational process (i.e., the more traditional interpretation), and more as the *process* of organizing information and creating meaning itself. A new burden, however, is then placed on the theorist, namely, to describe and measure the transitory state of equilibrium. There are at least two basic ways to address this problem: from the "inside," emphasizing how the self experiences the relational process; and from the "outside," looking at practical consequences. An experiential approach would adopt the former approach. However, Kegan (1982) noted that Piaget took the latter course, viewing the assimilation/accommodation process descriptively from the outside; he focused on the successes in problem solving associated with different stages of cognitive development. Consequently, the approach ignored the assimilation/accommodation process from the participatory angle of the self. Presumably, this is one reason why the theory is often faulted for failing to provide a sufficient look at the role of emotion and motivation in development (Sternberg, 1984). In fairness to Piaget, however, there were larger historical reasons that led many psychologists to ignore the internal reference. Aside from a few existential and phenomenological approaches, these participatory questions have seldom been raised in the field of developmental psychology; when they have, they often lacked theoretical and methodological rigor to allow intersubjective verification.

In summary, Piagetian theory is helpful for linking optimal experience and complexity to foundational ideas in the developmental literature, but for several reasons it does not suffice for the purposes of this chapter. The theory tells us little about how the relational process between self and environment is *experienced by the self,* thus it tells us little about what—in human terms—motivates development. Assimilation, accommodation, and equilibration, while important for locating the action of development in the relation between self and environment, are notoriously vague as concepts that can be measured and studied; they therefore have limited utility. If, however, a framework of internal reference is adopted, new research opportunities arise. For instance, if equilibrium indicates a complex relationship that is fully involving, then it becomes possible to look at development from a perspective that emphasizes full involvement as a measurable criterion of the self-environment negotiation process. Much can be learned about this process, we believe, by adopting a phenomenological perspective that focuses on the experience of self-environment relations. For instance, what does a complex relationship feel like? How can relationships that are too one-sided—too integrated or too differentiated—be recognized phenomenologically?

Piaget suggested answers to the earlier questions in concepts such as *functional pleasure* and in brief references to intrinsic motivation. Unfortunately, he never developed these ideas in much detail. For instance, Piaget observed that infants laughed at their own power, tried to make interesting sights last, and manifested enjoyment (i.e., functional pleasure) when acting competently. Such observations were short-lived and limited to the early sensorimotor stages, however, as he turned his attention to the external manifestations of successful problem solving associated with higher stages of cognitive development. In so doing, a fruitful course of investigation was abandoned, one that might have added significant insights about the search for equilibration, and the enjoyment and intrinsic motivation associated with it.

The claim here is that moments of self-environment equilibrium are experienced by the self as optimally rewarding. To the extent that Piaget was correct in asserting that the search for equilibration energized human development, it is accurate to say that development is also motivated by the search for optimal experience. It is through monitoring such experiences that we can learn to recognize when relationships are complex and when they are too differentiated or too integrated (i.e., having overemphasized either accommodation or assimilation, respectively). And to the extent that the person is defined less as a static entity and more as a relational process, then a theory of optimal experience becomes an important link to a fuller understanding of the developing person.

Other Perspectives on Self-Environment Equilibrium

It is worth mentioning a few other early proponents of the view that development is motivated by a search for self-environment equilibrium, and that such equilibrium is linked with optimal experience and the full development of the person. Although many thinkers could be mentioned here, going as far back as Aristotle (MacIntyre, 1984), we have selected three more recent authors whose insights are relevant: Friedrich Nietzsche, Abraham Maslow, and Carl Rogers. Their views are linked through an idea they shared: *love of fate.* All three believed that love of fate was *the* mark of the fully developed person, whether that person was called "overman" by Nietzsche, "self-actualizing" by Maslow, or "fully functioning" by Rogers (1969); and all of them depicted the love of fate as a deeply rewarding synchrony between self and environment.

What does it mean to love one's fate? For Nietzsche, it meant the affirmation of life through a full acceptance of its circumstances. Despite hardship or obstacle, or perhaps more accurately, because of them, one would not wish for one's life to unfold in any other way. This is so because the process of overcoming obstacles provides the opportunities through which the person is created. *Amor fati,* or love of fate, is a central concept in Nietzsche's philosophy: "My formula for greatness in a human being is amor fati: that one wants nothing to be different, not forward, not backward, not in all eternity. . . . Not merely bear what is necessary . . . but love it" (1968, p. 714). The fully alive person (i.e., the *over* man) is not content with just surviving and adapting, but is intent on transcending himself or herself. Such experiences of transcendence provided his deepest motivation: "I want to learn more and more to see as beautiful what is necessary in things; then I shall be one of those who make things beautiful" (1974, p. 223).

Maslow's (1971) studies of self-actualization and peak experiences led him to a similar conclusion. The healthy person is not motivated just by deficits, simple endurance in life, or by the survival of self or offspring, but also by growth. Based on his observations and interviews with individuals he considered to be self-actualizing, including creative artists and scientists, he concluded that the processes of growth were often rewarded with fulfilling peak experiences. These experiences coincided with a synchronous relationship between self and environment; he referred to this synchrony as a balance of "inner requiredness" with "outer requiredness," or "I want" with "I must." Especially true of self-actualizing persons, during such experiences "one freely, happily, and wholeheartedly embraces one's determinants. One chooses and wills one's fate" (p. 325).

Rogers (1969) endorsed a very similar perspective. He comments about the fully functioning person: "He wills or chooses to follow the course of action which is the most economical vector in relation to all the internal and external stimuli because it is that behavior which will be the most deeply satisfying" (p. 294). As a result, he continues, "The fully functioning person . . . not only experiences, but utilizes, the most absolute freedom when he spontaneously, freely, and voluntarily chooses and wills that which is absolutely determined" (p. 295). Thus, as with Nietzsche and Maslow, a love of fate corresponds to an inner-outer synchrony that evokes a deeply rewarding experience. And like both of the other thinkers, Rogers (1959) believed that the person was not satisfied with mere survival, but was instead motivated to expand and grow: "The inherent tendency of the organism is to develop all its capacities in ways which serve to maintain or enhance the organism. It involves not only what Maslow terms 'deficiency needs' . . . [but also] expansions in terms of growth. . . . Life processes do not merely tend to preserve life, but transcend the momentary status quo of the organism, expanding itself continually and imposing its autonomous determination upon an ever-increasing realm of events" (p. 196).

Love of fate reveals a relational synchrony of self with environment; as such, it is the mark of distinction of the developing person. It is deeply rewarding because it coincides with the most "economical vector" between inner and outer stimuli.[1] Most important, it is an experience that confirms, manifests, and accompanies what the organism wants most: to develop and to grow. Such complex relationships maximize being through the differentiation and integration of the person, which allows the fullest expression of life and energy. In Piagetian terms, to grow means that a new equilibrium has been

[1] It is worth pointing out again that when the person is defined relationally, as in this chapter, it can be misleading to fall into the familiar use of the terms *subject* versus *object, inner* versus *outer,* and so on. This terminology tends to isolate the person from the world, which is not our intention. On the contrary, it is more consistent with our perspective to say that the "location" of the person is neither inner nor outer, or, perhaps better, is both at once.

attained, one that is "higher" in the sense of being more synchronous with reality (i.e., as formal operations are more attuned to reality than concrete operations). What these thinkers add to Piaget's perspective is more about the internal reference, and the intrinsically motivating character of moments of growth.

The Optimal Experience of Flow

Flow theory continues in this tradition of thought and further defines in experiential terms such moments of synchrony and growth. A flow experience (Csikszentmihalyi, 1975, 1990, 1993; Nakamura & Csikszentmihalyi, 2002) describes a prototypical experience of an intrinsically motivated self-environment fit. Flow is a deeply involving and enjoyable experience that has been described by a variety of different respondents, in a variety of cultures, in strikingly similar ways (Csikszentmihalyi & Csikszentmihalyi, 1988). Athletes refer to it as being "in the zone," poets as being visited by the muse.

In flow, a person is fully concentrated on the task at hand. There is a feeling that action and awareness merge in a single beam of focused consciousness. In flow, it is very clear what needs to be done from one moment to the next; goals are clearly ordered and sequenced. One also knows immediately how well one is doing: Feedback is unambiguous. The tennis player knows whether the ball was hit well, the violinist hears whether the note just played was right or wrong. In flow, a person loses self-consciousness; the vulnerable ego disappears. In George Herbert Mead's terms, there is only "I" without a "me" to worry about. The sense of time becomes distorted to fit the experience; hours seem to pass by in minutes. When these dimensions of experience are present, one is willing to do what makes these feelings possible for their own sake, without expecting extrinsic rewards. The poet enjoys the experience of writing, the bond trader enjoys beating the market, and both will continue doing these things because they are enjoyable—even in the absence of the rewards of fame and wealth.

Finally, and most important, flow begins to be experienced when there is a fit between the *skills* of the self and the *challenges* afforded by the environment. For example, we cannot enjoy a tennis game if our opponent is either much better or much worse than we are; only a game with a well-matched opponent is likely to be enjoyable. We don't enjoy reading a novel in which plot and characters are too difficult to visualize, nor one that is too obvious and predictable; we enjoy instead the text that fits our imaginative powers. It is this aspect of enjoyment that is most relevant to the relational synchrony that lies at the heart of optimal personhood.

The experience of flow marks an achieved balance of arousal-increasing and arousal-decreasing processes. The flow model describes this balance in terms of the fit between perceived challenges and skills: An activity wherein challenges predominate increases arousal; an activity wherein skills predominate reduces arousal. Thus, a synchrony of challenges and skills permits a state of deep involvement, while the pitfalls of either over- or underarousal (i.e., anxiety or boredom) are avoided. In this sense, flow seems to represent the subjective dimension of that "goodness of fit" between temperament and environment that underlies several developmental perspectives (e.g., Lerner & Lerner, 1987; Thomas & Chess, 1977).

In fact, it could be argued that flow is likely to be experienced when an individual is fully functioning relative to the developmental opportunities that a given stage provides. For instance, in terms of the Eriksonian stages, an infant at the first stage whose only opportunity for action is feeding itself and whose only skill is to suck milk will be in flow when at the nipple. As the opportunities for action in the physical and social environment grow, so must the child's abilities to act increase if the child is to continue to experience enjoyment. Therefore, one would expect the challenges provided by the tasks of identity, intimacy, generativity, and integrity to present further, more complex opportunities for flow.

Anxiety and boredom are aversive phenomenological states that result from a disequilibrium in the momentary fit between skills and challenges or self and environment. When challenges are too high relative to skills, the asynchronous relationship leads to anxiety because one feels overwhelmed, out of control, threatened by a loss of integrity and order. In contrast, when skills are too high for the given challenges, the fit between self and environment is too easy and comfortable, resulting in the loss of novelty and therefore a decrease in the sense of focus and urgency.

The balance of skills and challenges can be described further in Piagetian terms. An assimilative mode indicates the existence of an organized, preexisting structure of information. That structure makes the processing of new information more automatic because it can be organized by the existing structure. The idea of "skills"

suggests an analogous process; a skill is a practiced response, one that is habitual and automatic. A skilled pianist, therefore, primarily relies on an assimilative mode when reading an easy piece of music. On the other hand, if the challenge of reading the score moves beyond the skills of the pianist, an accommodative mode comes into play. Accommodation is a more effortful response to novelty (Block, 1982). In attentional terms, accommodation uses more voluntary, controlled, or linear processes, rather than immediate, automatic, or global processes, as does assimilation (Schneider & Shiffrin, 1977). To say that a flow experience is more likely when skills and challenges are in balance is to say that flow is more likely when assimilation and accommodation are in equilibrium and immediate and voluntary uses of attention work in concert to intensify concentration. Rathunde (1993, 2001a) has also described this coming together of immediate and voluntary modes of attention as undivided interest, a synonym for flow that implies something about the underlying attentional dynamics (see also Rathunde & Csikszentmihalyi, 1993).

Piaget (1962, see pp. 147–150) recognized that when assimilation dominates accommodation the fit between self and environment is too rigid and one-sided. In an *overassimilative* mode, the self habitually perceives the environment subject to its own preconceptions, and consequently one might say that objectivity is diminished (Kegan, 1982). Overassimilation is equivalent to an imbalance of skills over challenges, and it feels like boredom. When bored, one is too "subjective," too habitual, and closed to new opportunities for action. Conversely, when accommodation dominates assimilation, or when novelty overwhelms the processing capacity of a preexisting structure, the self is unhinged and oriented outside of itself; it is so decentered toward the uncertainty in the environment that the possibility for feelings of relatedness, connection, and meaning are diminished. *Overaccommodation* is equivalent to the imbalance of challenges over skills, and it is experienced as anxiety. When anxious, one feels at the mercy of environmental circumstances that are beyond one's control and thus blinded by the excessive stimulation to ways of making sense of the situation.

When skills and challenges are in equilibrium, action is fully centered on the relationship between self and environment. The skilled pianist who performs a challenging score is drawn into a more involving relationship. The automaticity of existing skills provides confidence, structure, integrity, and a foundation from which the new material can be reached; yet, the reach is not easy, and the novelty of the score demands careful attention. It is just such a combination that requires full attention—resources brought to bear through habits of "chunking" the information, and resources mustered through effort. And this full attention is experienced as a feeling of flow, of being caught up in a single energy system that unites self and environment. Motivation to continue the activity becomes intrinsic—not in the mistaken sense of "in" the self, but rather "in" the self-environment relationship.

Yet another way to look at the full involvement of flow is in the combination of positive affect and heightened concentration. Some activities may evoke positive affect, but will soon be experienced as frivolous if they lack focus and the need for concentration. Alternatively, some activities begin with intense concentration, but are soon experienced as oppressive and alienating because they are devoid of pleasant feelings. Dewey (1913) has called the former experiences "fooling" and the latter "drudgery." In contrast, he described optimal experiences as affectively and cognitively engaging, providing both a sense of playfulness and spontaneity, as well as a corresponding seriousness and focus on goals. For some individuals, work is drudgery because serious concentration is not accompanied by positive emotion, and leisure is fooling because good moods cannot be sustained due to a lack of focus. For other, more fortunate people, work and leisure are both thoroughly enjoyed, and in fact indistinguishable; they provide for undivided interest, and each is a type of "serious play" (e.g., Rathunde, 1993, 1995).

The implications of an affective-cognitive synchrony for the quality of experience can also be described using the psychoanalytic constructs of *primary* and *secondary process* thinking. These two processes are often dichotomized in an either/or fashion. Primary process is identified with the pleasure principle and with dreams, myth, emotional thinking, fantasy, poetic feeling, and so on. Secondary process, in contrast, is identified with the reality principle and thus with reason, logic, science, intellect, abstract thought, and so on. A severe split between these two processes is tantamount to pathology. In Freudian terms, relatively uninhibited primary process thought suggests the dominance of the id over and against the ego and superego, whereas the dominance of secondary thought processes is suggestive of the repressive control of the superego over and above the ego and id. A healthy ego, at least to a greater extent than an un-

healthy one, is able to synchronize id and superego or primary and secondary process thought therefore achieving greater self-regulation, freedom, and health. Several psychoanalytic thinkers have also associated such a synchrony with creativity (Jung, 1946; Kris, 1952). The implication is that healthy ego development is presumably related to the ability to regulate arousal and negotiate optimal experience.

Finally, that optimal experiences synchronize affective and cognitive modes is supported by the descriptions of flow, peak experiences, and the emergent experiences of fully functioning persons. Respondents describe flow as an enjoyable merging of action and awareness in that actions follow each other spontaneously and unselfconsciously, yet there remains an intense and careful monitoring of feedback in relation to one's goals. Maslow (1971) has commented about peak experiences: "We have found that peak experience contains two components—an emotional one of ecstasy and an intellectual one of illumination. Both need to be present simultaneously" (p. 184). Finally, and in a similar vein, Rogers (1969) described the fully functioning person as both a *participant* and an *observer* of an emergent experience: "The sensation is that of floating with a complex stream of experience, with the fascinating possibility of trying to comprehend its everchanging complexity" (p. 285). Thus, in all of these descriptions there is a component of automatic and controlled attention, a component of primary process thinking that is immediate, and an aspect of secondary process thinking that is monitoring the environment. Such combinations of information, like the contrasts of dark and light in a painting, are what makes such experiences remarkable and interesting.

Flow and Development

Just as we cannot step in the same river twice, we cannot enjoy the same activity with the same intensity more than once. To continue providing optimal experiences, flow activities must constantly be *re-created.* It is this fact that makes the flow model a developmental model. As Piaget also observed, disequilibrium between the processes of assimilation and accommodation is inevitable and needs to be continually addressed. In our phenomenological perspective, disequilibrium is signaled by boredom and anxiety—two inevitable life experiences. In the simplest terms, one transforms boredom by finding challenges and overcomes anxiety

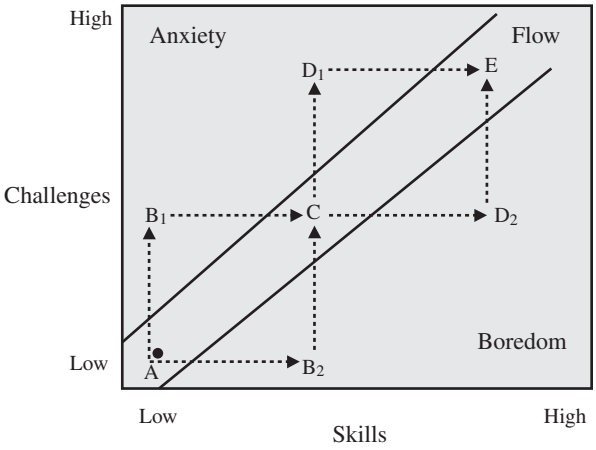


Figure 9.1 The dynamics of flow. A, C, and E are enjoyable states of equilibrium of increasing complexity. B_1 and D_1 are states of anxiety that require learning new skills for a person to return to flow. B_2 and D_2 are states of boredom that require new challenges for a return to flow.

by building skills. It is through this perpetual dialectical process that development proceeds; and it proceeds in the direction of greater complexity because optimal experiences cannot be recaptured through a regression of skills and challenges, but only through their progression (Csikszentmihalyi, 1990; Csikszentmihalyi & Rathunde, 1993).[2]

Figure 9.1 shows how the raising of skills and challenges has been depicted in previous discussions of the flow model. To reenter the "flow channel" from states of boredom or anxiety, challenges and skills must be raised appropriately. In other words, flow can proceed from boredom or from anxiety. Once "inside" the experience, there are common features to flow, but seen in the broader context of before and after, the experiences are quite different. For instance, the transition from boredom is a process of *finding* something novel enough that it tests one's skills. Boredom, in a healthy personality, initiates a process of searching for a meaningful challenge, not just a diversion; as interest and curiosity draw the self out of its shell, boredom wanes, and experience becomes more intrinsically rewarding. In contrast, the

[2] Our focus here remains on immediate subjective experience, but it is possible to adopt other time frames and perceive the same dialectical tension. In other words, one may overcome the anxiety of an entire week, month, or year by finding a way to build new skills. As mentioned earlier, the same is true of equilibrium; that is, it can refer to immediate experience or stages that characterize larger periods of time.

transformation of anxiety is more like *solving* a problem. A positive response to anxiety does not shrink back to a position of safety; rather, it initiates a process that tries to resolve a dilemma. With increasing success and a growing sense of resolution, order, or closure, anxiety dissipates, and the quality of experience improves.

Similar to the movement away from boredom, the movement from assimilation toward accommodation involves problem finding in the sense of pushing the limits of an existing information structure. When assimilation is joined by an emergent sense of accommodation, but not overwhelmed by it, experience is optimal. For instance, an individual who has just learned to ski discovers new challenges by testing the limits of his or her skills on new hills; these challenges, if not overwhelming, intensify the skier's experience because they evoke greater concentration and require quicker adjustment. When, however, it becomes clear that a particular challenge is beyond reach, the skier feels out of control and anxiety sets in. In this instance, accommodation that moves toward assimilation is a problem-solving process that rebuilds a new structure. Perhaps the skier needed to learn a more effective way to turn to control the speed of descent; as the first clumsy actions become more practiced and second nature, anxiety lessens, attention is withdrawn from the self-consciousness of "forced" turns, and, at least until the new turns become too automatic, the experience of skiing is again exhilarating.

Apter (1989) has referred to such changes as arousal *reversals.* In his reversal theory, he calls the former problem-finding mode *paratelic* and describes it as an arousal-increasing mode wherein attention is focused on the here and now, and more on means as opposed to ends. In contrast, the latter problem-solving mode is referred to as *telic.* In this mode, attention is more focused on the goals of an activity, there is a future-time orientation, and the activity moves toward reducing arousal. In everyday language, the paratelic mode is more spontaneous, fun, and playful; the telic mode is more serious and worklike. The rewards of a paratelic mode are those resulting from the movement from boredom to optimal arousal; in contrast, a telic mode finds optimal rewards by moving from anxiety back to optimal arousal. Consistent with the perspective here, optimal experience is simultaneously paratelic and telic.

Psychological Complexity and Development

What qualities facilitate optimal experiences and the trajectories of growth that have been outlined earlier? Such a question is not intended to change the relational focus in favor of more traditional psychological conceptions of personality traits or characteristics. However, to discuss the person often requires a way of speaking about qualities or characteristics "as if" they were contained in the person. Despite the pitfalls of such language, the qualities discussed can still be thought of in relational terms; and to the extent that they are depicted as relatively stable "traits" of persons, they can also be conceived as stable ways of relating to the environment.

Bronfenbrenner (1992; Bronfenbrenner & Morris, Chapter 14, this *Handbook,* this volume) has recently discussed such personal attributes in terms of their relational potentials and collectively refers to them as *developmentally instigative characteristics.* Such characteristics have two features. The first refers to qualities that encourage or discourage certain reactions from the environment; for instance, a baby acts as a stimulus to others by being either fussy or happy, and calls forth certain corresponding reactions. A more important developmental influence and, according to Bronfenbrenner, one that is much ignored and in need of study by developmentalists is *developmentally structuring characteristics* that involve an active, selective orientation toward the environment. About such instigative attributes he comments: "When they are manifested over time in particular settings, [they] tend to evoke complementary patterns of continuing developmental feedback, creating more complex developmental trajectories that exhibit continuity through time. The result is a person-specific repertoire of evolving . . . dispositions that continues to be distinguishable over the life course, and hence constitutes what we recognize over the years as the person's individual personality" (1992, pp. 219–220).

There are several examples of developmentally instigative qualities explored in the literature that are relevant to optimal experience. For instance, Block (1982) has discussed how ego resiliency is related to the ability to move through the dialectic of assimilation and accommodation. When novelty overwhelms a particular schema, accommodation is needed to restore psychic equilibrium. However, the movement through assimilation to accommodation may, at first, prolong and intensify an anxious state until progress is made toward reorganizing the structure. If a person is unable to muster the effort needed to push through anxiety, he or she may persist with failed assimilative efforts (i.e., perseveration, fixation), or might selectively ignore the challenge. An ego-resilient person is better able to keep

the two modes in equilibrium and therefore avoid the particular dangers of overassimilation and overaccommodation by being flexible in changing life conditions. Such a person is capable of spontaneity under conditions of overassimilation, and capable of self-direction and organization under conditions of overaccommodation (Block, 1982; Block & Block, 1980).

Bandura's (1977) concept of *self-efficacy* also suggests a relational quality that is relevant for the dialectic of optimal experience. For instance, persons with high self-efficacy *slightly overestimate* their ability to master challenges. This "distortion" has the effect of inducing persons to select challenges that are slightly beyond their current capacities. In other words, it induces the confidence to take a risk. Because the selected challenge is not unrealistic, however, the person is able to master it, thus reinforcing and strengthening the feeling of self-efficacy. The same could be said about the positive feedback loop that coincides with high self-esteem. After experiencing flow, self-esteem increases, and people who experience flow more often (i.e., who spend more time in high-challenge, high-skill situations) report higher levels of self-esteem (Adlai-Gail, 1994; Wells, 1988).

Ford and Lerner's (1992) description of the competent person as possessing *flexible* self-regulation is also relevant here: "A competent person can modify effectively his or her own behavior and/or the features of the social situation in which he or she is engaged. . . . People can, for instance, change their topic of conversation if they find they are boring or upsetting others; or if they are bored or upset by what is being said, they can turn the topic of conversation round to more pleasant topics, or terminate it. . . . Such competency—such efficient self-regulation—is an instance of how one may act as a producer of their own development" (p. 85).

Such a competent or flexible person is, of course, not free from the biological and environmental constraints that bind everyone else. We are all limited by particular inherited and learned characteristics, and most settings impose social and physical demands that cannot be ignored. Nevertheless, it is possible to negotiate a *goodness of fit* with the setting. According to Ford and Lerner (1992), flexible persons are better able to (a) evaluate the challenges facing them and their abilities or skills to respond; (b) select and gain access to those contexts where there is a high probability of a good fit, and avoid those contexts where there is not; and, as in the earlier example of a conversation; and (c) either change themselves to find a better fit (e.g., change their own pattern of response in a conversation—or accommodate) or try to change the context itself (e.g., try to alter others' topics of conversation—or assimilate). A competency in self-regulation thus allows us to be more active shapers of our development.

Far from reducing an ecological and interactionist perspective to the side of personality, these observations about self-regulation reinforce the notion that the self-environment relationship is the primary factor in development. Instigative or structuring qualities, though, set in motion *interaction styles* that are sustained by the accumulation of their own consequences. Results from certain actions instigated by the individual produce a stream of feedback that sustains the trajectory of growth. It is not that the person remains the same in every environment; rather, it is that there is *consistency in the way that a person varies behavior as a function of the environment.* Developmentally instigative characteristics produce a continuity in the way behavior is changed. In this chapter, we are especially interested in the continuity of response that directs the person toward self-environment equilibrium and optimal experience.

An example of how such consistency in change might operate is helpful. In overly challenging situations, a person might recognize that arousal reduction and skill building are the appropriate course of action; in times of boredom, the person might seek to increase arousal by seeking higher challenges. Such a person, who at one moment manifests a conservative attitude of perseverance and at another, a confidence aligned with taking risks, might seem to the outside observer to be inconsistent, contradictory, and at the mercy of environmental influences. On the contrary, from the internal reference of subjective experience, such flexibility or complexity of response displays consistency. Only then is a person capable of making choices that move predictably in the direction of optimal experience.

In this chapter, and in previous work (Csikszentmihalyi, 1996; Csikszentmihalyi & Rathunde, 1993; Csikszentmihalyi, Rathunde, & Whalen, 1993), persons that exhibit such active-interactive orientations have been referred to as being *psychologically complex,* or more simply being complex. A complex person has *the self-regulative capacity to move toward optimal experiences by negotiating a better fit or synchrony of self with environment.* Traditional conceptions of personality that claim a stability of response, regardless of environmental circumstances, have been shown to be lacking (Barker, 1950; Mischel, 1968). We do not dispute the fact that the social and physical demands of different

contexts evoke different behaviors. Traditional conceptions of personality, however, fail to look for *consistency within the change,* or the consistency in the ways that a person varies his or her behavior as a function of the setting (for further discussion of this point, see Cairns & Hood, 1983; Sroufe, 1979).

Physical scientists describing complex systems are also aware of this phenomenon of consistency in change; they call it emergent self-organization (e.g., Prigogine, 1980). Waldrop (1992) comments:

> Self-organizing systems are adaptive, in that they don't just passively respond to events the way a rock might roll around in an earthquake. They actively try to turn whatever happens to their advantage. . . . Complex systems have somehow acquired the ability to bring order and chaos into a special balance. This balance point—often called *the edge of chaos*—is where the components of a system never quite lock into place, and yet never quite dissolve into turbulence, either. The edge of chaos is where life has enough stability to sustain itself and enough creativity to deserve the name of life. . . . The edge of chaos is the constantly shifting battle zone between stagnation and anarchy, the one place where a complex system can be spontaneous, adaptive, and alive. (pp. 11–12)

Although these words were written to describe the beauty of fractals—the patterned turbulence of rivers, weather, and other natural phenomena—they apply equally to psychological systems. This edge of chaos (and conversely, the "edge of order") has been described here as equilibrium, balance, and synchrony. Optimal development also involves such a predictable unpredictability, and an unpredictable predictability. Note the similarities between the following passage from Rogers's (1969) description of the fully functioning person, and the earlier description of complex physical systems:

> It should therefore be clear that this person will seem to himself to be dependable but not specifically predictable. If he is entering a new situation with an authority figure, for example, he cannot predict what his behavior will be. It is contingent on the behavior of this authority figure, and his own immediate reactions, desires, and so on. He can feel confident that he will behave appropriately, but he has no knowledge in advance of what he will do. . . . It is the maladjusted person whose behavior can be specifically predicted, and some loss of predictability should be evident in every increase in openness to experience and existential living. In the maladjusted person, behavior is predictable because it is rigidly patterned. If such a person has learned a pattern of hostile reaction to authority . . . and if because of this he denies or distorts any experience which should supply contradictory evidence, *then* his behavior is specifically predictable. . . . I am suggesting that as the individual approaches the optimum of complete functioning his behavior, though always lawful and determined, becomes more difficult to predict. (pp. 292–293)

The behavior is lawful, according to Rogers, because the fully functioning person will attempt to select the best path toward growth and the synchrony of inner and outer demands. But this choice, in any given situation, cannot be known in advance, and that is why it is misleading to think of the person in anything but relational terms. Our concept of psychological complexity tries to avoid static definitions by viewing the person in terms of the dialectical process of integrating and differentiating self and environment. As Kegan (1982) observes, the person is "an ever progressive motion engaged in giving itself a new form." Here, in contrast to traditional approaches that see the person as a result of this process, the focus is placed not on what a person does, but the doing that a person is. Such an approach distinguishes the person from "self" (i.e., a more psychological, subject-oriented perspective) and from "role" (i.e., a more sociological, object-based perspective). It also facilitates the recognition of similarities in the experiential process that underlies unique instances of self-regulation across the life course. We turn now to examples of such self-regulation.

EXAMPLES OF COMPLEXITY IN LATER LIFE

The optimal developmental outcomes described in the previous section are predicated on the achievement of psychological complexity. Complexity describes dialectical polarities in the person that enable him or her to continually negotiate, and renegotiate, an optimally rewarding self-environment fit. On the most general level, these polarities involve structure *breaking* and *building* and problem *finding* and *solving*. A person with such potentialities is presumably better able to "instigate" development by flexibly working at the edges of order and novelty, without letting one or the other dominate. In other words, they can negotiate a self-environment fit that is integrated and differentiated or that attains an optimally arousing balance of order and novelty.

The terms structure breaking and problem finding characterize the move away from boredom because they provide what is needed to raise arousal and increase stimulation; structure building and problem solving describe the process of reducing arousal, a movement back to order that is needed when experiencing anxiety. An enjoyable and deeply involving conversation, for example, requires participants to express differing points of view; it also requires the coordination of such views for common understandings. When a conversation drags, a person with psychological complexity would presumably find a "problem" by working to stir things up, perhaps by expressing an opinion, offering new information, playing devil's advocate, and so on. If a conversation is losing its continuity, and participants are expressing widely divergent points of view, such a person would work to build bridges and shared understandings. The particular qualities that represent complexity would depend on the particular domain of activity, but in general it can be stated that structure-breaking/problem-finding phases start from an implicit sense of order that coincides with a push to take a risk, test a limit, be open to new challenges, and seek the edge of chaos. Conversely, a structure-building/problem-solving phase begins from a taken-for-granted sense of diversity or novelty, which coincides with a determination to find closure, be diligent, and patiently seek the edge of order.

To get a better sense of the phenomenology of the process, it is also useful to select another example and use the constructs of skill and challenge to consider how attention must be used during problem finding versus solving. Suppose that we are trying to understand how a student maintains optimal arousal while putting together a research paper for a history assignment. The need for problem finding starts from an implicit sense of order. Perhaps, the student has a good understanding of the topic at hand; he or she has read the assigned book, taken notes in class, and his or her high skills in the situation are more than adequate to complete the assignment. However, it may not be very interesting to do so. In terms of attention, having high skills means that the student does not have to expend much effort; understanding the topic is relatively automatic. Therefore, to convert boredom to optimal arousal and deeper involvement while doing the assignment, the challenge is to differentiate his or her understanding of the topic; it is to find new information and ideas that put his or her skills to the test. If the student takes the challenge seriously, such a situation sets up a good opportunity for flow: *His or her high skills provide a context of integration and "free" voluntary or selective attention to work on the challenge to differentiate.* At some point during this process, the intensity of his or her involvement should trigger a flow experience.

Conversely, problem solving begins from a context of differentiation. Let's say that the student became really involved in searching for new information and was enjoying the process. He or she gathered a variety of new sources, jotted down a number of new ideas, and worked for days on the challenge of differentiating her original understanding. Now, however, boredom with writing an easy paper is no longer his or her problem. The ground has shifted and he or she feels anxious when considering the task ahead; the challenge has become the need to integrate all the new information. In terms of attention, the same dynamics apply, but the focus is reversed. Now, the student's skills allow him or her to recognize multiple dimensions of the historical topic under study. The student does not have to expend much effort to consider all the different facets that he or she has become aware of over the past few days of research. If he or she takes this new challenge seriously, the situation also sets up a good opportunity for flow: His or her skills provide a context of differentiation that frees up voluntary or selective attention to work on the challenge of integration.

The key point in both cases is that automatic and voluntary modes work together to intensify the present moment. In the problem-finding situation (i.e., transforming boredom), voluntary effort was doing the work of differentiation and finding novelty, and immediate attention was providing a sense of integration and order (i.e., the students original grasp of the assignment). In the problem-solving scenario (i.e., transforming anxiety), voluntary effort was used to do the work of finding new connections that could order the new information (e.g., finding a new theme or thesis for the paper), while immediate attention provided a kaleidoscope of new facts. In both cases, skills (automatic attention) and challenges (voluntary attention) must work in a complementary fashion to negotiate optimal arousal. Flow occurs when both are engaged and deepening the intensity of the present moment beyond what either mode could accomplish on its own.

We turn now to illustrate more concretely how some individuals in later life manifest complexity. While there are a number of dialectical models of adult thinking that are conceptually similar to our notion of complexity, there is still a need for more specificity in regard to how

these dialectical thought processes are *actually manifested* by real persons. Recently, we had the opportunity to gather information relevant to this underexplored issue from a pool of interviews collected at the University of Chicago about creativity in later life (Csikszentmihalyi, 1996; Nakaumura & Csikszentmihalyi, 2003). The 100 respondents in this study were individuals who were successful on the cultural stage (13 had been awarded Nobel prizes, and the rest had achieved comparable renown), but their lives can be used as examples of success in a broader sense, as modeling optimal developmental trajectories. In the interviews, they talked about many factors related to their impressive accomplishments, but more important, their words gave excellent descriptions of how complexity is enacted in actual life situations. We draw from these interviews to make more concrete the theoretical ideas that have been presented thus far. These examples of later-life complexity, in turn, set the stage for a discussion of some connections that can be made to current developmental research.

Individuals who have been recognized for their eminent creativity may seem inappropriate for illustrating complexity. Creativity is often identified with one part of the developmental dialectic we have described, namely, the part associated with breaking structures and finding problems. It is true that creativity is most often identified with such differentiating responses; but that is probably because many creativity studies have set out to measure creativity in this way. However, creativity, which is sustained over a great length of time and results in eminent achievement, is not something that rests on divergent thinking alone; convergent, integrative thinking is equally important.

A few perspectives on creativity have recognized a bipolar psychological process that is characterized by the coordination of an affective immediacy and cognitive detachment to drive the integration and differentiation process.[3] For instance, Getzels (1975) has commented: "Despite the self-evident need for strenuous effort . . . creative thinking entails, at least in some degree, surrender to freely rising playfulness" (p. 332). Einstein's account of his creative process suggested a similar duality (Hadamard, 1954, p. 142): a phase of "associative" play and a more "laborious" phase requiring logical coherence. Gardner (1993, 1998) has recently suggested that a playful, childlike quality survives alongside the mature intellect of seminal creators (see also Simonton, 1984). Barron (1969) described creativity as a synchrony of immediacy and detachment in a chapter entitled "Cycles of Innocence and Experience." The title is drawn from the poetry of William Blake and contrasts "prelogical" thought that is concrete, spontaneous, and free of abstraction (i.e., innocence) with thought that utilizes "reason" and therefore has a logical structure (i.e., experience).

Why is creativity associated with both immediacy and detachment? Our model suggests that both uses of attention are needed to move toward the subjective rewards of structure breaking and structure building. Creativity is not just about what is gained by playfulness and spontaneity that is free from abstraction; it is also about what is gained from the voluntary and directed control of attention that takes effort. Each use of attention creates the conditions of the other; and both must work together to integrate and differentiate information. Barron's (1969) description of creativity said much the same thing, without the emphasis on subjective experience, "In the creative process there is an incessant dialectic and an essential tension between two seemingly opposed dispositional tendencies: the tendency toward structuring and integration and the tendency toward disruption of structure and diffusion. . . . The task is to avoid sacrificing one possibility to the other. We must be able to use discipline to gain greater freedom . . . tolerate diffusion, and even occasionally invite it, in order to achieve a more complex integration" (pp. 177–179).

Dimensions of Complexity

Next, we illustrate psychological complexity and optimal development by concentrating on seven polar dimensions. This number is arbitrary and could be expanded or reduced depending on the number of examples under discussion. These polarities, we believe, reveal the capacity for finding optimal experience through a process of differentiation and integration.

A central polarity that surfaced in the University of Chicago study of creativity[4] was the combination of

[3] Although the focus here, as in much of the chapter, is on psychological processes, creativity cannot be reduced to this level.

[4] Quotations not otherwise attributed are taken from interviews the authors and other members of the University of Chicago research team collected in the course of a project entitled Creativity in Later Life, sponsored by the Spencer Foundation (Csikszentmihalyi, 1996).

agency and *communion,* that is, the drive toward both independence and interdependence (Bakan, 1966). This is often seen as an "androgynous" trait, in that it combines elements traditionally associated with both males and females. Why has androgyny been linked to positive developmental outcomes (Baumrind, 1989), as well as to eminent achievement (Spence & Helmreich, 1978)? Our perspective suggests that both characteristics play a role in negotiating optimal experience through structure changing and building; therefore, persons with a predominance of either attribute (i.e., a highly sex-typed individual) are at a disadvantage, at least in domains of activity where these qualities are especially important for competent performance.

One such domain is interpersonal relations or, more concretely, the act of communicating. Skills of communication are essential for playing one's role on the cultural stage, no matter what that role is. It is equally central to business management (Leavitt, Pondy, & Boje, 1989), the emotional well-being of families (Larson & Richards, 1994), and political leadership (Gardner, 1995; Kouzes & Posner, 1995).

For instance, students who cannot speak their mind to a teacher (agency) or listen to what that teacher has to say (communion) will not get the most out of the relationship, neither will the teacher. The teacher or student, therefore, who is capable of agency and communion in interpersonal communication—"speaking" as an individual and "listening" in a posture of openness to the other—would presumably be at an advantage for learning from such communication and for experiencing optimal rewards in the process. Charles Cooley (1961), though not discussing androgyny or optimal experience, said much the same thing about the optimally healthy person. After suggesting that males were, in general, less socially impressible and more inclined to an aggressive, solitary frame of mind than females, he commented: "So long as a character is open and capable of growth it retains . . . impressibility, which is not weakness unless it swamps the assimilating and organizing faculty. I know men whose character is proof of stable and aggressive character who have an almost feminine sensitiveness regarding their seeming to others. Indeed, if one sees a man whose attitude toward others is always assertive, never receptive, he may be confident that man will never go far, because he will never learn much. In character, as in every phase of life, health requires a just union of stability with plasticity" (p. 828).

In our interviews with persons who had successfully negotiated adult roles, the combination of agency and communion was often evident. For instance, the path-breaking historian John Hope Franklin told about a memorable teaching experience that involved taking a graduate seminar to North Carolina to study the Reconstruction period. The class was exploring the idea advanced by a book claiming that segregation, and the Jim Crow laws of the 1880 to 1890s, were relatively new and therefore not "sanctified by age." When asking one of the students how he was progressing, Franklin recalled:

> His eyes were just sparkling. . . . He had found practices, as well as laws, segregating blacks and whites from much earlier. . . . And so he was saying that [the author's] thesis was collapsing. That was an overstatement to be sure. He was overly enthusiastic, but he was excited, and I got excited about a finding like that . . . of course, [the author] had made some exceptions . . . and this [the student's findings] fell, in part, in the excepted category. But it doesn't detract from the fact that he was excited. And I was excited because he was excited, you see?

In the anecdote, Franklin reveals subtle and complex social skills. He listens to his student with an attitude of acceptance and shared enthusiasm, without, for the moment, judging or correcting his student's overly enthusiastic response. By being unobtrusive, receptive, and patient—in other words, by manifesting some of the key qualities of communion—Franklin was facilitating his student's agency and joyful discovery. Although aware that the student was overly enthusiastic, and somewhat in error about the facts, Franklin decided that the joyful moment was better left alone because the student would need to draw on that excitement to complete the hard work that lay ahead. Franklin continued:

> Those students who will do the long haul are always willing to put the time and attention to the solution that the problem requires; one has to continue to be patient. . . . And that means that the student can't fudge or cheat or stretch his materials. He's got to stick with what the findings are. In my teaching I always give examples of that sort of thing among reputable historians. Not that I'm trying to debunk or anything like that, but I will point to a passage of widely and highly respected work and indicate to them just the way in which this particular historian misrepresented, and in some instances, prevaricated about the facts. I go back and show them what the facts were. Those are things I think are important.

Thus, the student's excitement stands, for the moment, but it will not stand in the way of the facts. Eventually, through more assertive episodes of instruction, Franklin demands that students coordinate their affectively charged insights with the careful work that distinguishes the scholar. In this way, Franklin balances communion and agency: Sometimes he listens to students to support their individuality, but at other times he speaks from a position of authority so that students must adopt a mode of communion and listen to him. Given his complex teaching style, it is not surprising that Franklin said of his over 50 years of teaching that it is "the thing that I like most of all."[5]

A second polarity that emerged from the interviews involved the productive tension in work between *passionate investment* and *detached objectivity.* One of the best examples of this combination emerged from an interview with another leading historian, Natalie Davis. Her awareness of this dialectical tension in her working style was unusually clear:

> Well, there're two different things—they overlap. One is this intense interest in finding out what was going on in the past. . . . I like to take mysteries to solve and I'm just very, very intrigued. . . . There is a kind of a rush of affect about it that I think is even more than curiosity. . . . I often say that I love what I'm doing and I love to write. . . . It's the curiosity part that pushes me to think about ways of finding out about something that I thought, or previous people thought, or people could not find out about, or ways of looking at a subject in ways that had never been looked at before. That's what keeps me running back and forth to the library and just thinking and thinking and thinking.

Equally as important as affect, however, is a mode of *detachment* that allows the person to make sure that the enthusiasm fits reality:

> It is very important to find a way to be detached from what you write . . . to let you work out the criticism. You can't be so identified with your work that you can't accept criticism and response. . . . The side of me that is more . . . detached tries to let the situation that I'm writing about, and its complexities . . . just be. The danger of too much affect is not only that the self gets too involved in it where we can't take criticism . . . but also that there's too much restructuring of the people around your own investment.

When asked about how these modes fit together, she elaborated:

> It is not as difficult now to be of several minds when I'm writing something: the side that's absolutely carried away, floating along with the project, and the side that's also detached and looking at myself. . . . They fit together. I don't feel it's one phase or the other. . . . It's immense curiosity in the beginning . . . you find all this stuff and then you begin to shape it. . . . The movement between identification, affect on one end, and detachment on the other, it has always got to be. And I feel this is present from the beginning, this kind of vacillation . . . the positioning of myself with different vantage points.

These passages provide a compelling illustration of complexity in action. Davis's passion and curiosity invite differentiation and save her work from tedium and rigidity; her detachment, in contrast, begins the process of criticism and the shaping of the multiple pieces into an organization that is not characterized by premature closure. In Davis's words, moments of synchrony between these two modes achieve a *multiple vision,* or being of "two minds" at once. Having these two vantage points prevents the work from being either conventional or idiosyncratic and allows it to develop and to grow.

A third polarity is related to the previous one, and can be described as the combination of *divergent* and *convergent* thinking. Convergent thinking involves the ability to find commonalities in varied information; it is a rational, problem-solving orientation representative of the intelligence that is often measured by IQ tests. Convergent thinkers have, so to speak, internalized the social mind; their thoughts usually can be predicted from knowing what others have thought. In contrast, divergent thinking is oriented toward individuality and problem finding. It involves fluency, or the ability to generate many ideas, explore multiple perspectives, make unusual associations, and so on (Guil-

[5] We have more to say later in the chapter about this interpersonal dynamic, and about how qualities such as agency and communion in children may be nurtured in family interaction. For instance, a mother's communion has often acted as a buffer for the father's agency, and vice versa. This traditional, sex-typed alliance is but one "solution" for creating a family context that spares children the fate of growing up in a home that overemphasizes one or the other quality and thus forces children into *one pattern of response.* We return to this observation when considering how early experience in the family may have consequences for attaining complexity in later life. For now, we point out that parents with androgynous parenting styles have reported *more enjoyment in parenting* (Lamb, 1982).

ford, 1967; Runco, 1991). This ability has been thought to be synonymous with creative thinking.

Divergent thinking, however, is not much use without convergent thinking as a counterbalance, and vice versa. This point came across in the remarks of another eminent scholar, the historian William McNeill. He described the starting point for his work as a process that led to "finding one's bent." Once an idea appeared in his mind, he found that it would spontaneously "crop up" in many different contexts, including some where he did not expect to find it. At some point in this divergent, differentiating process, however, a more convergent frame of mind was needed to gauge how the idea fit with reality. The later mode helped to bring closure and required more meticulous work, self-criticism, and intellectual integrity. The following quotation discusses this coordination of divergence (openness) and convergence (closure):

> I've looked at myself and my colleagues and thought about what it is that makes some people able to get things done, write books, write articles, complete tasks, and someone else of equal intelligence, perhaps of superior intelligence, never quite gets things done—he wastes time, he throws his time away, deadlines go past and still he isn't done. I think the most important discrimination involves two things. One is the capacity to focus attention—called attention span in small children—which varies enormously. There are people who are always looking for an interruption and run off like that [snaps fingers] given the possible chance. You have to have tunnel vision. . . . The other thing is that you can handle the hypercriticism. . . . I know some of my colleagues who had extremely powerful and original minds, but who looked at what they had written and always said "it's not good enough." That is hypercriticism and they're really frozen by their own critical capacity. There is a nice balance—surely you want to be critical of what you've done, rewrite it, think it through carefully, not splash it on to a page and say that's it. But too much criticism can be self-destructive, and too much openness can be self-destructive. You have to have a balance, a certain openness up to a certain point, and then get it done, and be willing when it comes time to do it, to say, . . . "I'm going to lock on this task now, it's time to do it." . . . [It is] closing things off at the right time, and not letting your critical faculty get so acute, so sharp that you can't get anything done. Both extremes I've seen act destructively upon . . . achievement. . . . They can be obstructive, perhaps, not destructive, but obstructive. . . . I think if you just study people around you reflecting on those who do and those who don't accomplish things they want to, these are the two pitfalls [too open, or too closed] that I've become aware of, things that obstructed very competent minds from achieving that which they wished to do.

A fourth polarity is again related to the previous two. Similar to the polarities of attachment/detachment and divergent/convergent thinking is the coordination of *playfulness* and *discipline*. The sociologist David Reisman, for instance, succinctly described such a synthesis in his comment that he "wanted at the same time to be irresponsible and responsible." The sculptor Nina Holton articulated in more detail the need for a sense of play and work to permeate the creative process:

> Tell anybody you're a sculptor and they'll say "Oh, how exciting, how wonderful." And I tend to say "What's so wonderful?" I mean, it's like being a mason. Or being a carpenter, half the time. But they don't wish to hear that because they really only imagine the first part, the exciting part. But, as Kruschev once said, that doesn't fry pancakes, you see. That germ of an idea does not make a sculpture which stands up. It just sits there. So, the next stage, of course, is the hard work. Can you really translate it into a piece of sculpture? Or will it be a wild thing which only seemed exciting while you were sitting in the studio alone? Will it look like something? Can you actually do it physically? Can you, personally, do it physically? What do you have by way of materials? So, the second part is a lot of hard work. And sculpture is that, you see. It is the combination of wonderful wild ideas and then a lot of hard work.

A third instance of this polarity was expressed by Jacob Rabinow, one of the most prolific inventors in the world. When working on a project that required more discipline than playful intuition, he would use a mental "trick" to slow himself down:

> Yeah, there's a trick I pull for this. When I have a job to do like that, where you have to do something that takes a lot of effort, slowly, I pretend I'm in jail. Don't laugh. And if I'm in jail, time is of no consequence. In other words, if it takes a week to cut this, it'll take a week. What else have I got to do? I'm going to be here for 20 years. . . . See? This is a kind of mental trick. Because otherwise you say, "My God, it's not working," and then you make mistakes. But the other way, you say time is of absolutely no consequence. People start saying how much will it cost me in time? If I work with somebody else it's 50 bucks an hour, a hundred dollars an hour. Nonsense. You just forget everything except that it's got to be built. And I have no trouble doing this. I work fast, normally. But if something

> will take a day gluing and then next day I glue the other side—it'll take 2 days—it doesn't bother me at all.

A fifth polarity that is less obviously related to the preceding ones is the coordination of *extroversion* and *introversion.* It is not uncommon that particular individuals prefer to be either at the center of action or at a spot along the periphery that allows them to observe what is going on. Generally, people tend to be either on one or the other side of this dimension; in fact, whether one is extroverted or introverted is held to be one of the basic and most enduring traits of personality (Costa & McCrae, 1980; McCrae & Costa, 1984). Complex persons, alternatively, seem to enjoy both the company of other people or solitude, depending on the demands of the moment. The physicist and writer Freeman Dyson, for instance, pointed to the door of his office and said:

> Science is a very gregarious business. It is essentially the difference between having this door open and having it shut. When I am doing science I have the door open. I mean, that is kind of symbolic, but it is true. You want to be, all the time, talking with people. Up to a point you welcome being interrupted because it is only by interacting with other people that you get anything interesting done. It is essentially a communal enterprise. . . . There are new things happening all the time and you should keep abreast and you keep yourself aware of what is going on. You must be constantly talking. But, of course, writing is different. When I am writing I have the door shut, and even then too much sound comes through, so, very often when I am writing I go and hide in the library where nobody knows where I am. It is a solitary game. So, I suppose that is the main difference. But, then, afterwards, of course the feedback is very strong . . . and you get a tremendous enrichment of contacts as a result. Lots and lots of people write me letters simply because I have written books which address a general public, so I get into touch with a much wider circle of friends. So it's broadened my horizons very much. But that is only after the writing is finished and not while it is going on.

In this comment, contact with people—talking, listening—is identified with keeping abreast of new things and different points of view. While interaction is a process of letting in information, closing the door for solitude is a process of limiting information. The door, so to speak, acts as a boundary between self and other much as intellectual detachment creates "distance" from spontaneous action so that feedback can be integrated. Others have noted that social interaction is a dialectical process between forces driving people together and apart, and either excessive openness or closedness has detrimental effects on relationships and personal growth (Altman, 1975; Altman, Vinsel, & Brown, 1981). An excessive orientation toward extroversion or toward introversion reduces our flexibility to negotiate a rewarding self-environment fit; it makes us more predictable, less sensitive to the moment, and therefore less complex in response to the variable needs of the situation. The introvert may forfeit the opportunity to grow because of lack of stimulation, and the extrovert because he or she does not take time out to reflect on experience.

The following quote from Piaget (1952) fits well with Dyson's description of the dialectic of contact and solitude:

> It is true that I am sociable and like to teach or to take part in meetings of all kinds, but I feel a compelling need for solitude and contact with nature. After mornings spent with others, I begin each afternoon with a walk during which I quietly collect my thoughts and coordinate them, after which I return to the desk at my home in the country. . . . [I]t is this dissociation between myself as a social being and as a 'man of nature' (in whom Dionysian excitement ends in intellectual activity) which has enabled me to surmount a permanent fund of anxiety and transform it into a need for working. (p. 55)

A sixth polarity might be described in terms of the interconnection between periods of *energy* and *quietude.* As one might expect, many of those interviewed for the study worked long hours with great concentration and intensity; however, this did not mean that they were slavishly tied to their work. On the contrary, it was not uncommon to come away from interviews with the impression of persons who were unhurried and at peace with themselves. It is especially startling to hear people with a lifetime of exceptional accomplishments to their credit describe themselves as fundamentally lazy. Only a self-imposed daily discipline, they say, kept them from giving in to the lackadaisical side of their nature.

Several told stories that helped to explain these apparently contradictory traits, stories that portrayed a harmonious interweaving of activity and rest. For instance, the economist Kenneth Boulding described working in beautiful, natural settings by "writing" with a tape recorder while looking at a mountain stream. And there were numerous stories of intense periods of work interspersed with naps, walks, bike rides, gardening, chopping wood, and other diversions that had more than

a restorative relation to work. The important theme that emerged linking these diverse anecdotes was that the energy of these persons was not controlled entirely by external schedules. Rather, they instinctively knew when to focus their attention and when to relax it; several commented that they had "mastered their own time." They considered the rhythm of activity and idleness to be important for the success of their work, and they learned such strategies from trial and error. The Canadian novelist Robertson Davies gave the following entertaining example:

> Well, you know, that leads me to something which I think has been very important in my life, and it sounds foolish and rather trivial. But I've always insisted on having a nap after lunch, and I inherited this from my father. One time I said to him, "You know, you've done awfully well in the world. You came to Canada as an immigrant boy without anything and you have done very well. What do you attribute it to?" And he said, "Well, what drove me on to be my own boss was that the thing that I wanted most was to be able to have a nap every day after lunch." And I thought, "What an extraordinary impulse to drive a man on!" But it did, and he always had a twenty-minute sleep after lunch. And I'm the same. And I think it is very important. If you will not permit yourself to be driven and flogged through life, you'll probably enjoy it more.

Finally, complexity was manifested by attitudes toward work that were at once *iconoclastic* and *traditional,* oriented toward blazing new trails while preserving the integrity of their respective domains of action. Contrary to the modern prejudice that holds that old ideas are probably wrong, and that anything new must be better than whatever is old, these individuals understood that ideas and practices that have been passed down through the generations must have had some advantages or they would not have been preserved, whereas novelties have not yet stood the test of time.

Without question, a strong and independent ego characterized many of those we interviewed; yet so did humbleness and a clear awareness that in their work they "stood on the shoulders of giants," and that their achievements were made possible only by the tradition in which they were trained. Confidence often fed into an aggressive, iconoclastic disposition; for instance, the Nobel-prize winning economist George Stigler stated:

> I'd say one of the most common failures of able people is a lack of nerve. And they'll play safe games. They'll take whatever the literature's doing and add a little bit to it. . . . So there's a safe game to play. In innovation, you have to play a less safe game, if it's going to be interesting. It's not predictable that it'll go well.

But innovation for its own sake does not make sense, except in relation to the tradition of thought that provides the background against which novelty can be recognized. The artist Eva Zeisel produces ceramics that have been recognized by the Museum of Modern Art in New York as masterpieces of contemporary design, yet she feels rooted to the artistic folk tradition in which she grew up as a young girl in the early decades of the century. She shows a keen awareness of the interplay between innovation and tradition in the following excerpt:

> This idea to create something different is not my aim, and shouldn't be anybody's aim. Because, first of all, if you are a designer or a playful person in any of these crafts, you have to be able to function a long life, and you can't always try to be different. I mean different from different from different . . . to be different is a negative motive, and no creative thought or created thing grows out of a negative impulse. A negative impulse is always frustrating. And to be different means not like this and not like that. And the "not like"—that's why postmodernism, with the prefix of "post," couldn't work. No negative impulse can work, can produce any happy creation. Only a positive one.

Dialectical Thinking and Optimal Experience

The concepts of agency, passion, divergent thinking, playfulness, extroversion, iconoclasm, and energy share common features, as do communion, detachment, convergent thinking, discipline, introversion, tradition, and quietude. This, of course, is partly due to the selective focus that was brought to bear on the interviews; in other words, to some extent we found in the interviews what we were looking to find. But there must be more to these polarities; countless related ones have surfaced in many fields of study and in different religions, mythologies, and philosophies in the East and West. They are present in the Buddhist philosophy associating the optimal experience of Nirvana with the middle path between the so-called yang qualities of the male (e.g., dominance, activity, aggression) and the yin qualities of the female (e.g., passivity, receptivity, yielding; Kuo, 1976). Notions of dialectical opposition are also woven into the fabric of Western thought from early philosophers such as Anaximander and Heraclitus, through Aristotle and Plato, and continuing through Marx, Hegel, and others

(e.g., Adler, 1927; Rychlak, 1976). Such oppositions have also characterized some of the most prominent theories of human development, from Freud's notions of the ego mediating demands from the id and superego to Piaget's dialectical model that we discussed earlier in some detail (see also Lerner, 2002; Riegel, 1973).

The emergence of related dialectical themes from so many different time periods and cultures provides a compelling reason for theorists of human development to continue to puzzle over their meanings. Our interpretation of the polarities culled from the interviews emphasizes the phenomenological perspective that we have tried to develop in this chapter. It looks across all of the complementary pairs and asks: How is each related to the optimal experience associated with structure changing and building, and thus with moving beyond boredom and anxiety? We see commonalities among traits like passion, playfulness, extroversion, energy, and among the corresponding traits of detachment, discipline, introversion, and quietude. The former group tends to manifest a style of attention that is immediate and subjective; a style more associated with assimilative modes and a lack of separation between subject and object. The latter group suggests attention that is voluntary and objective, or a style that is more in line with accommodative modes. As we have argued, both uses of attention must work in a complementary fashion, sometimes working together to raise arousal and find a new challenge (i.e., differentiation), and sometimes working to lower arousal and build new skills (i.e., integration). In a context of playful exploration, for example, sometimes discipline must be used to recognize a new challenge and increase novelty; and sometimes it must be used to build new skills and increase order. Having both traits, therefore, provides a person with a self-regulative capacity to find and sustain optimal experience.

A phenomenological interpretation such as the one earlier cannot provide a comprehensive explanation for the existence of these various polarities, but it does provide an often-overlooked entry point for theorists and researchers who are interested in exploring dialectical themes. If one of the most important goals of development is a person's flexibility in adjusting to new situations (Kelly, 1955; Lerner, 1984), then the material from the interviews attests to potential for human flexibility in later life. But more important, it helps to explain how experience is optimized by avoiding the boredom of overly integrated states and the anxiety of overly differentiated ones. The polarities are instructive for understanding the process of finding challenges and building skills, and thus also for understanding the temporary equilibrium of challenges and skills that trigger flow experiences.

Why, for instance, has John Hope Franklin enjoyed teaching so much? How are the qualities of agency and communion related to his enjoyment of teaching? A phenomenological interpretation suggests that his complex teaching style was *self-correcting,* thus allowing him to avoid the negative experiences associated with being too receptive to students or too directive toward them. The former problem plagues those who try to accommodate every encounter with the other; it transforms interaction into an activity that is experienced as overwhelming, lacking in control, and thus inviting anxiety. Conversely, consistently ignoring the interests and points of view of others, never changing one's behavior in response to the encounter, makes interaction monotonous and boring.

Both extremes are avoided in Franklin's teaching style because he is capable, as the changing situation warrants, of shifting between the qualities of agency and communion. In the example cited earlier, he did not hesitate to be emphatic in response to his student's overly enthusiastic "discovery." He listened attentively to the student, letting him take the lead. Yet, based on knowledge gained through this episode, Franklin will be better able to find the right time to insist that the student check his facts. In this way, his agency as a teacher is supported by insights gained through communion. And the same can be stated in reverse: Franklin's responsiveness to his student was initially set up by taking his class to North Carolina and assigning the study of the Reconstruction period. In this way, the polarity of agency and communion helped to negotiate the most rewarding fit between teacher and student and presumably made this experience of teaching more enjoyable.

A similar reasoning would hold for the other polarities. The process of work (e.g., writing, research, sculpting) was presumably more rewarding for those who described various combinations of playfulness with discipline, passion with detachment, and so on, because of the greater flexibility in forging a self-environment fit. For instance, Davis's notion of observing immediacy (i.e., being of two minds at once) allowed her to recognize problems as they arose in the spontaneous course of working. Curiosity elicited a need for detachment to shape the material generated in this exploratory mode; this feedback from active engagement led to the discovery of problems that needed to be recognized and solved. Borrowing a phrase from the philosopher and theologian Paul Tillich (Gilkey, 1990), it might be said of Davis and

others who expressed similar dialectical themes that their *objectivity was based on intense subjectivity.* And the converse of this statement is likewise relevant: *their subjectivity was based on intense objectivity.* In other words, it was through recognizing and solving problems (e.g., through critical revision of written work, "tricking" themselves into more patient modes of work, closing the door for solitude) that they constructed the skills and sense of confidence that, in turn, supported modes of further exploration.

In summary, the polarities described earlier instigate a person's development while optimizing his or her experiences; each describes, albeit in different ways and in regard to different activities, a flexibility in negotiating a fit between self and environment (for further discussion of goodness-of-fit models see Lerner, 1984; Thomas & Chess, 1977).[6] One extreme of each polarity tends to describe the more unselfconscious process of assimilation (i.e., using existing schemas or skills to make processing more automatic and efficient), and the other half describes the more painstaking process of accommodation (i.e., using selective effort to change one's skills). A person who is able to coordinate both processes can (a) effectively counterbalance differentiation with integration, and vice versa; (b) avoid the loss of psychic energy associated with persistent boredom or anxiety; and (c) better direct and invest attention in optimally arousing and growth-enhancing activities.

Complexity and Wisdom

Of the roles available in the cultural repertoire for an older person, perhaps the one that best captures the optimal developmental outcome is the notion of *wisdom.* We now examine more closely what this concept entails and how it is related to the dynamics of complexity developed in the previous section.

Wisdom as a quality of the long-lived person in a community is a theme that repeatedly occurs in Eastern and Western cultures. Such persons are thought to have a special insight that enables them to make or advise the "best" course of action in a given set of circumstances. The transmission of this idea across countless generations and societies argues for its validity on evolutionary grounds. Just as biological information that helps survival is transmitted from one generation to the next, it is reasonable to believe that the cultural transmission of this concept, with its rich web of meaning, is important for similar reasons (Csikszentmihalyi & Nakamura, in press; Csikszentmihalyi & Rathunde, 1990).

There are many names by which a wise person is known: mentor, sage, counselor, elder, teacher, and so on. All of them connote one attribute that we believe is central: *an ability to select, or help others select, a course of action that is optimal for survival and growth, based on insight in regard to relevant life processes.* The wise person, in the broadest sense, is able to give good counsel about solving fundamental problems of living (Baltes & Smith, 1990). Such counsel, in both the East and the West, has historically been linked to reflection on life experiences; through reflecting on the successes and failures in a long life, the wise person develops a *meta-awareness of the process of the self-environment relationship* (Rathunde, 1995). A wise teacher, for instance, has been described as unobtrusive, discrete, and patient, qualities that facilitate the joyful self-discovery of younger individuals by allowing them to make mistakes that further their growth (Chinen, 1984; Clayton & Birren, 1980). Such decisions of noninterference (or interference) are based on a superior awareness of complex interpersonal processes, as apparently was the case with the historian John Hope Franklin's interaction with his student.

A central characteristic of wisdom, mentioned earlier, is the ability to transcend narrow, specialized thinking and to see events in their broader contexts. John Reed, former CEO of Citicorp and one of the most astute and successful captains of finance, describes his ways of approaching problems:

> I have always been a person who had to understand the context within which I operate. Some people are perfectly capable of coming in and saying, "Gee, the cars are going out with bent fenders, what do I have to do to get rid of that?" and they'll just figure out what machine is bending the fender. It'll never interest them who designed the car, who is going to own it, or any of the other externalities. I'm not that way at all. I'll work a problem, but in order for me to identify with it, I have to have a context. So I get curious: Who is going to drive the car? Why was it designed this way? Does the bending of the fender have to do with the design? That is the pattern of my thought process—I have always tried to put it into a context.

It is important to note that Reed does not claim that his holistic, contextualized approach makes him a more

[6] Lerner (1984), in addition, contains an in-depth, multidisciplinary look at human plasticity, its foundation in evolutionary processes, and the developmental importance of flexible self-regulation.

successful businessman; in fact, he provides examples of very effective CEOs whose tunnel vision expresses only convergent thinking. But he claims that personally he enjoys the more complex contextual approach and could not think otherwise. (Of course, to continue in his role, Reed had to satisfy the objective rules expected of a person in his position, and in fact, during the last 4 years of his tenure, the value of his company's stock appreciated by over 400%.)

Contemporary research on wisdom suggests useful standards for the process of optimal human development. Sternberg (1990) describes wisdom, in contrast to intelligence and creativity, in the following way: "The wise person seeks to understand the meaning and limitations of this [existing] knowledge. The intelligent person seeks to make optimal use of this knowledge. The creative person, though, wishes to be freed from this knowledge" (p. 153). Using the analogy of three branches of government, Sternberg associates wisdom with a *judicial* function of mental self-government, intelligence with an *executive* function, and creativity with a *legislative* function. Such a tripartite schema is consistent with what has been said thus far about complex systems. A creative/legislative response represents the movement toward differentiation, or the attempt to go beyond what is known and to generate novelty. An intelligent/executive response, in contrast, can be thought of as the movement toward integration, in that it seeks consistency based on establishing clear and predictable parameters for action. Finally, a wise/judicial response expresses a contextual evaluation of the process of knowing and therefore an understanding of the strengths and limitations of legislative/creative and executive/intelligent responses.

Attaining wisdom allows the person to combine these self-governing functions in a way that is optimal for development. A creative response may generate movement toward change, but for this reason it may not be useful in situations that call for decisive action. An intelligent response may reinforce consistency, but would be inadequate for generating new ideas. A wise response would reflect an awareness of how each function compensated for the limitations of the other: Intelligence would be rigid if not informed by creativity, and creativity would lead to chaos if not reined in by the focus of intelligence. In the final analysis, it is wisdom that takes into account specific self-environment circumstances, evaluates them in terms of process, and thus gains oversight as to when creative responses must give way to more intelligent ones, and vice versa. A wise response would therefore reflect what Rogers called the predictable unpredictability of the fully functioning person: whether a particular response (i.e., seeking change or stability) is appropriate may not be known in advance; yet, the action that best fits the situation at hand will reliably be chosen, and such actions may reflect either continuity or discontinuity (see also Lerner & Busch-Rossnagel, 1981). Thus, wisdom is yet another way to describe the flexibility of the complex person who finds the best path toward growth and optimal experience (Rathunde, 1995).

Recently, a number of researchers investigating adult development and *postformal cognition* have similarly depicted the flexibility and the dialectic performance of so-called wise persons (Brent & Watson, 1980; Clayton & Birren, 1980; Holliday & Chandler, 1986; Kramer, 1983; Labouvie-Vief, 1980, 1982; Pascual-Leone, 1990; Sinnott, 1984). Labouvie-Vief (1990), for instance, notes the dualities described by Piaget (e.g., assimilation and accommodation), by Freud (e.g., primary and secondary processes), by James (e.g., the spontaneous "I" and the conceptual "me"), and even by contemporary neuropsychologists who contrast two different anatomically and chemically based processing systems (Tucker & Williamson, 1984). She utilizes the historical distinction between *mythos* and *logos* to label these dual modes. Mythos signifies *a close identification of the self with the object of thought* (i.e., a mode of subjectivity where knower and known are indivisible); logos signifies the use of reason, or *the ability of thought to separate subject and object,* to logically analyze a relationship.

Labouvie-Vief (1990) conceives wisdom as *reconnecting* these two important ways of relating to the world. Traditionally, they are often set against each other and dichotomized. Thus, mythos has come to be identified with emotion, the body, subjectivity, and other so-called feminine characteristics; logos, in contrast, because of its correspondence to rational thought, the mind, objectivity, and so on, has been perceived as more masculine.[7] This is also the dichotomy that underlies the gender differentiation of children in our culture (Gilligan, 1982; Gilligan, Lyons, & Hanmer, 1990). If

[7] It is worth noting that this alignment of objectivity and subjectivity with masculine and feminine characteristics is best suited to instrumental domains, where it is men who have traditionally had to learn to accommodate to reality demands; this alignment would often be reversed in expressive, social activities, where women have had to assume more objectivity.

wisdom reconnects these modes by looking beyond their illusory polarization, then such a description comes close to the meaning of complexity.

Others have identified related polarities that are characteristic of wisdom. Meacham (1983) has described a balance of *mature faith* and *cautiousness;* Erikson, Erikson, and Kivnick (1986) discuss the same idea as the blending of *trust* and *skepticism.* Trust and faith allow one to engage activities wholeheartedly and with spontaneity that leads to new ideas and connections; skepticism and caution, in contrast, slow down this movement to integrate the emergent connections in a way that best cuts with the grain of reality. The dissociation of these qualities not only describes a condition that has negative consequences for individuals, it also sheds light on unwise practices in a larger social system. For instance, Tillich's project of synthesizing objectivity and subjectivity implied a cultural critique. He suggested that modern science, by overemphasizing the scientist's need to be detached to know the object (i.e., by ignoring the reverse fact that subjectivity provides the basis for objectivity), has primarily identified itself with the objective-detachment pole of the dialectic, resulting in the disassociation of technical knowledge from *human* concerns and interests. This, in turn, has resulted in the many current problems and dangers associated with the undirected use of technology.

Wisdom is a construct that depicts the fullest expression of what has been described here as psychological complexity. The wise person develops, to a greater extent than most, the capacity to move toward optimal experiences by understanding the dynamic relation of self and environment. This is perhaps why wisdom is often discussed in the context of states of transcendence or ecstasy. The wise person, presumably as the result of reflection on a long and rich life, understands the need for integration to avoid anxiety and disorder, and the need for differentiation to avoid boredom and stagnation. Because of their ability to coordinate subjective and objective modes (Labouvie-Vief, 1990, 1994), self-regulating the process of integration and differentiation becomes more feasible. Such persons are best prepared to turn any situation to their advantage by consistently moving toward synchrony, but in an unpredictable fashion that depends specifically on time, place, and context.

Descriptions of the wise person, like descriptions of any complex system, will of necessity be paradoxical, and are best expressed through dialectical notions that emphasize process, opposition, and interaction in specific circumstances. Thus, developmental research aimed at better understanding such instigative characteristics of persons will undoubtedly prove to be difficult. Nevertheless, productive research is already proceeding under the aegis of wisdom as a potential adult outcome (e.g., Baltes & Smith, 1990). A phenomenological interpretation of wisdom may add to this growing body of work. In addition to empirical studies, more hermeneutic studies of wisdom in various cultures and historical periods would also be useful.

In summary, this section attempted to illustrate more concretely some of the characteristics of psychological complexity, namely, qualities enabling a harmonious dialectic between differentiation and integration. Characteristics that make it possible to take an active role in creating one's environment and furthering development comprise only a part, perhaps only a small part, of the vast array of biological and cultural influences on the development of the person. Nevertheless, they comprise the part that is most human in human development. The capacity for lifelong learning and the relative lack of "hardwired" responses to the environment are perhaps *the* distinguishing characteristics of humans. Lerner (1984) reached the same conclusion, arguing that what is optimally developed in development is the style or self-regulative capacity to adapt to unforeseen contextual conditions (i.e., changing self to fit context or context to fit self). Although such instigative characteristics are probably related to genetic predispositions (e.g., aspects of temperament may influence modal levels of openness/withdrawal, ability to focus attention, and so on; see Thomas & Chess, 1977), they are also influenced by contexts of socialization, especially the family. Thus, a better understanding of how such characteristics may emerge through child development is a question central to understanding the development of the person.

THE FOUNDATIONS OF COMPLEXITY IN CHILD DEVELOPMENT

Having sketched our ideas about adult complexity in theoretical terms and through examples of desirable outcomes, we turn our attention to examining how the foundations of complexity might be established in child development. Although it is impossible to trace with precision the evolution of the outcomes we have discussed, or support a strong causal position on the link between early experience and these outcomes, the assumption

here is that the previous discussion will make it easier to identify processes in the early years that facilitate the full development of the person. Many of the presumed connections await further research and verification. To limit the focus of the discussion, we make three additional assumptions:

1. If complex outcomes are manifested by dialectical polarities, then contexts that socialize such outcomes will presumably have a dialectical character.
2. Of the many relationships that are important for child development, two undoubtedly are crucial: the parent-child relationship and the teacher-student relationship. We therefore limit our discussion to these two interactive contexts. Our discussion of parent-child interaction starts in adolescence and works its way back to early childhood and infancy. Our discussion of the school context is focused on the important transitional period of early adolescence, a time when mature patterns for self-regulation are beginning to form.
3. If there is a plausible link in the ontogenetic development of complexity from birth to old age, then it is reasonable to assume that human beings are prepared by evolution to (potentially) develop in such a way. Thus, we conclude the chapter by exploring the thought that complexity is a goal of human development rooted in our evolutionary history.

Guided by these limiting assumptions, this section explores the possible relationship between children's socialization and complex outcomes in adulthood. The approach taken is exploratory, with two intentions: to develop further the experience-based theoretical perspective in this chapter and to stimulate future research on these and related issues.

The Importance of Social Context

How is a foundation for later-life complexity established in childhood? We agree with Bronfenbrenner (1992) that mature self-regulation is in large part the legacy of past social experience: "It is true that individuals often can and do modify, select, reconstruct, and even create their environments. But this capacity emerges only to the extent that the person has been *enabled* to engage in self-directed action as a joint function not only of his biological endowment but also of the environment in which he or she developed. There is no one without the other" (pp. 223–224). As to what type of environment is optimal: "Extremes either of disorganization or rigidity in structure or function represent danger signs for psychological growth, with some intermediate degree of system flexibility constituting the optimal condition for human development" (p. 241). We would add that such system flexibility is important for the possible emergence of optimal experience.

Following Piaget, most research that has explored the constructive nature of thought has not so valued interpersonal processes. Theoretical work on social cognition, for instance, has focused on how internal constructions—*developed independently of contact with other people*—affect the perception and therefore the dynamics of social interaction (Kahlbaugh, 1993). Many of these theories, in addition, do not incorporate the dialectical insights of Piaget (Kuhn, 1978). Thus, few attempts have been made to theorize how thought, in general, develops out of dialectical interactions between self and other. Even less common is any attempt to view these interactions in light of how they affect ongoing experience.

In part, as a result of the slow assimilation of the Russian perspective on development represented by the work of Luria and Vygotsky, a greater emphasis is currently being placed on how the person develops in a sociocultural context, and how higher mental functions are "internalized" from social interaction (Bruner, 1990; Mead, 1934; Rogoff, 1990; Stern, 1985; Wertsch, 1979, 1985, 1991). The time is ripe for approaches that *link dialectical developmental principles to social interaction.* Toward this end, the thought of James Mark Baldwin (1906, 1908, 1911) provides an important historical context (Kahlbaugh, 1993) and critical insights for our attempt to link phenomenology to social processes.

Baldwin's thought is relevant to the concerns in this chapter for several reasons. His theory of "development" (i.e., progress in constructing "platforms" of organization) is dialectical and rests on syntheses of dualistic oppositions. Much of what has been said earlier in regard to Piaget also applies to Baldwin: Development proceeds through the interplay of a conservative, assimilating function that fits information to preexisting structures and a change-oriented accommodation function that reconstructs the subject due to opposition encountered in environment (Broughton & Freeman-Moir, 1982).

More important for our purposes are three differences between Baldwin and Piaget. First, Baldwin was

more attuned to the importance of subjective rewards associated with successful adaptation; he believed positive experiences induced repetition, and repetition led to the formation of habits. As did his colleagues John Dewey and William James, Baldwin (1906) talked at great length about *interest* as the motivating force of attention (pp. 41–44). Thus, his insights are more in line with our goal of providing a phenomenological rendering of assimilative and accommodative processes.

A second crucial difference is the way Baldwin conceptualized optimal adult development. Piaget emphasized logical thought in his final stage of formal operations and the capacity to formulate rational hypotheses about relationships in the world. In his highest stage, hyperlogic, Baldwin emphasized *an aesthetic appreciation of the world that transcends dualities.* His descriptions of this stage resemble contemporary theories on postformal operations and wisdom (Basseches, 1980; Kramer, 1983), and our earlier comments on complexity in later life: "The intuition of reality reached in aesthetic contemplation preserves all the meaning of fact or truth except its externality to experience, and all that of use or worth except its subjectivity in experience; thus essentially removing from the constitution of the real the opposition of inner and outer, subject and object" (Baldwin, 1911, p. 256).

The most important difference between Baldwin's and Piaget's models has to do with the role of social processes. For Piaget, the quality of the social environment could affect the speed with which children develop through various stages, not the quality of the stage itself, and social processes became more important as children developed more mature forms of thought. Social processes were more integral to Baldwin's account of development. He recognized the greater novelty associated with social interaction, and therefore its more important role as a source of resistance that promotes growth: "Persons remain, even after each vital experience with them, still the unreduced; and the individual's mass of surging psychic tendencies and dispositions comes up again and yet again to the task of appropriating them in the molds of habit and recognized fact" (1906, p. 61). Thus, one reason Baldwin located the development of the person more centrally in social interaction was because such encounters were the source of continual challenge and novelty and therefore a powerful stimulus to development.

It was through interaction that the assimilating and accommodating functions were stretched to the highest degree, and *these functions were developed from birth in coordination with a primary caretaker.* Through *imitation,* for instance, a child accommodates the other; but imitation is never "pure" in the sense of a replication because actions are infused with private meaning, and what is learned is always in relation to subjective experience. Similarly, when appropriating a word, one makes it one's own by filling it with personal intention (Bakhtin, 1981). In this way, accommodation is "creative" and not passive mimicking. Through a process of *ejecting* the self, the child assimilates the other on its own terms; when contradictions arise, the self is reconstructed. Thus, the dynamics of development are much like Piaget's, but relations with a primary caretaker are seen as essential to the dialectical growth of the self, and social dependency becomes essential for development to occur (e.g., Tobach, 1981; Tobach & Schneirla, 1968).

Interaction with a more powerful person (in relation to the child) will encourage accommodation; interaction with a less powerful person will favor assimilation. A mother might be thought of as "less powerful" when she is reactive to the wants and desires of the infant; in other words, when *she* accommodates, the child assimilates. A mother is "more powerful" when the child must accommodate, perhaps by imitating actions, reacting to verbal or physical stimulation, adjusting to schedules of feeding, and so on. One can see in this general dynamic how the dialectical growth of the self might proceed in a positive direction through the mutual give and take of mother and child, or how habits of unsuccessful assimilation or accommodation might develop through relations with an overly active or a chronically passive mother.

The common terms *love* and *discipline*[8] represent parenting behaviors that encourage complexity: When a parent appropriately mixes love with discipline, a child develops successful habits of assimilation and accommodation, thus making the coordination of these modes, and optimal experiences, more likely to occur. Over time, children socialized in homes that balance love with discipline develop a superior capacity to *self-regulate* their attention and respond to the environment in ways that promote optimal experience and growth. In other words, they are more likely to manifest the

[8] Too often the word *discipline* is equated with punishment. The word is a derivation of the Latin discipulus, meaning pupil. This meaning reflects the idea that discipline is about *training the mind and character through experience.* Insofar as punishment furthers such training or instruction, its meaning is consistent with discipline.

development-instigating characteristics that are associated with complexity.

There is a variety of ways parents might provide children with a healthy combination of love and discipline. One strategy is what we now think of as the traditional nuclear family. Fathers and mothers have historically created a well-rounded system through a division of labor: Fathers play the role of disciplinarian and mothers that of nurturer (Parsons & Bales, 1955). The manifestations of such traditional sex-role divisions are apparent in parental styles of interaction. For instance, fathers, due to their active styles, are more often a source of stimulation, whereas mothers are a source of arousal modulation or comfort (Field, 1985). In general, fathers have been less sensitive to a child's perspective, and thus they have constituted a source of external challenge for the child; mothers have been more willing to subordinate their attention in support of their children's interests.[9] Although contemporary families maintain less rigid boundaries between parental roles, one still can observe strong vestiges of these historical patterns (Larson & Richards, 1994).

The traditional solution, however, is but one of many possible ones. One or both parents, or a single parent, can adopt an *androgynous* role as a nurturer and disciplinarian. Arguably, such a style holds distinct advantages for the well-timed delivery of love and discipline, and thus for achieving a more satisfying parent-child relationship (i.e., a mother would not have to rely on "Wait until your father gets home" to provide discipline, and a father would not have to use the refrain "Go ask your mother" when asked for support). It is not hard to imagine several other ways that love and discipline can be effectively combined. A nurturant family, for instance, may enroll the child in a school that is intellectually and physically rigorous. Or a child with accomplished and demanding parents may be accommodated by an attentive caregiver or by other members of the extended family. The point is not to argue for a particular family organization (although some arrangements may be advantageous); rather, the claim is that *children who develop strong habits of assimilation and accommodation in some proximal context of socialization* are more likely to develop a mature ability to self-regulate experience as adults.

[9] If reacting to a "more powerful" father is associated with learning habits of accommodation, then the increasing absence of father involvement in modern homes could help to explain the apparent decline of social integration in many communities.

Parent-Child Interaction and the Growth of Complexity

The earlier hypotheses are used next to explore and integrate various perspectives on parenting over the course of child development. In the following selective review, we attempt to link parental love and discipline, or *support* and *challenge,* to three stages of child development: adolescence, early childhood, and infancy.

Parenting in Adolescence

Does a family still influence adolescent development? Do the qualities of love and discipline still matter, and in the ways discussed earlier? Even if interactions with parents were related to habits of self-regulation, it could be argued that patterns established in childhood would be relatively "fixed" by the teenage years; in Vygotskian (1978) terms, the "intermental" would have already become the "intramental." Furthermore, adolescents encounter a much wider social circle than young children and fall under the sway of peer influence. They have also wider unsupervised exposure to symbolic media (e.g., television, books, music, and film), as well as the effects of schooling. Despite all of the previously mentioned influences, however, a great deal of research suggests that parental qualities like love and discipline (referred to by various names in the literature) are still important for adolescent development (Damon, 1983; Irwin, 1987; Maccoby & Martin, 1983).

Diana Baumrind (1987, 1989) has associated the combination of "responsiveness" and "demandingness" (i.e., authoritative parenting) with optimal competence in adolescence, operationally defined as the androgynous combination of *agency* and *communion.* Cooper and her colleagues (Cooper, Grotevant, & Condon, 1983) found that the combination of *connection* and *individuality* in family interaction (i.e., listening and coordinating views, and expressing individual options) was related to adolescents' identity achievement and role-taking skills. Both of these outcomes demonstrate effective differentiating and integrating processes that are associated with psychological complexity: Identity achievement requires a period of *crisis* (i.e., the exploration of alternatives) and *commitment* (i.e., firm decisions after considering the alternatives; Marcia, 1966); role taking requires considering others' perspectives, and then integrating one's own (Cooper et al., 1983). Finally, Stuart

Hauser's (1991) research has revealed how supportive (*affective enabling*) and challenging (*cognitive enabling*) "moves" in family conversations were related to higher adolescent ego development; it also seems that higher stages of ego development are increasingly dialectical in character (Kegan, 1982; Loevinger, 1966).

Our own research with families and adolescents is consistent with the earlier findings, although it emphasizes experiential outcome measures. For instance, talented adolescents who perceived their family contexts as *supportive* and *challenging* reported more optimal experience and interest in their daily lives, especially while doing school activities; parents perceived by their sons and daughters as supportive and challenging reported more satisfaction in their relationships with their children and in their own lives (Csikszentmihalyi et al., 1993; Rathunde, 1996). A follow-up study of a representative national cross-section of approximately 700 teenagers replicated these findings with a more diverse sample: After adjusting for the adolescents' gender, grade (6th through 12th), ethnic background (African American, Asian, Latino, Caucasian), and parental education, adolescents from supportive and challenging families reported more optimal experience and interest in school (Rathunde, 2001a).

Why is a supportive and challenging family context associated with positive experiential outcomes? As we have argued earlier, two basic modes of attention must work in close synchrony to negotiate optimal arousal, flow, and the growth of knowledge: a passive-immediate mode of attention and an active-voluntary one (James, 1890). In Piaget's terms, these modes correspond to assimilation and accommodation, respectively. Separating these two ways of engaging the world disrupts optimal experience and learning and can lead to fooling or drudgery (Dewey, 1913, 1938), two short-term "solutions" to under- or overarousal. A family context that is supportive and challenging facilitates the interconnection of both uses of attention and is, therefore, more likely to be associated with adolescents ability to find optimal experience. A family environment is challenging when parents expect adolescents to take on more mature responsibilities, learn new age-appropriate skills, take risks that lead toward greater individuation, and so on. Thus, a challenging context is one wherein adolescents acquire the training effect of discipline; they "practice" reorganizing their attention, recognizing the views of others, and formulating plans of action that accommodate progressively new expectations and goals. When a parent creates a supportive environment by taking care of everyday necessities, listening in a nonjudgmental way, allowing the adolescent to explore interests, and so on, an adolescent can engage the world in a way that is less self-conscious, less constrained by the demands of reality, and more attuned to his or her own subjectivity and imagination. This theoretical reasoning is consistent with other perspectives in the field that stress the benefits of some combination of love and discipline in the family, but it is derived from our experiential approach.

There has been some empirical confirmation for these assertions. For example, we used the ESM to operationalize these two modes of attention (i.e., immediate involvement and a voluntary focus on goals) and collected information from adolescents about the levels of support and challenge they received in their families. In both cross-sectional and longitudinal studies, and with students from a variety of socioeconomic status (SES) and ethnic backgrounds, results consistently showed: (a) a relationship between the perception of high family support and adolescents' immediate moods and energy, and (b) a significant link between the perception of family challenge and adolescents' selective attention to important goals. Furthermore, not only did adolescents from families that *combined* high support with high challenge report more flow and interest in their learning activities, they invested more time in them, and developed their skills to a higher degree (Csikszentmihalyi et al., 1993; Rathunde, 1996, 2001a). Our interpretation of these results suggests that a supportive and challenging family, because it allows flexibility in the assimilation and accommodation dialectic, makes it easier for adolescents to negotiate a good person-environment fit, and such a fit is more likely to result in optimal arousal and experience.

Repeated experience in such families is likely to result in the formation of self-regulative habits (i.e., preliminary signs of psychological complexity) that facilitate turning boredom and anxiety into flow. In contrast, the same studies showed that adolescents from high support/low challenge families (i.e., permissive environments) were more invested in passive leisure (e.g., television viewing) and other modes of "fooling," and adolescents from low support/high challenge families (i.e., more authoritarian environments) spent a great deal of time on important school activities, but reported negative moods and more "drudgery" while doing them. These family contexts, in contrast to ones that provide strong support and challenge, may be reinforcing patterns of regulation that will increasingly prevent, rather

than enhance optimal experience. Future studies are needed to explore these possibilities.

Parenting in Childhood

If adolescent experience is tied to conditions in the home, despite the greater influence of friends, school, and the media, it is likely that the quality of younger children's experience is *even more closely tied to conditions at home.* Barbara Rogoff's (1990) research is especially relevant to this issue. She has studied parents and children in a variety of cultural settings, using a Vygotskian perspective that emphasizes the development of mind through interpersonal interaction. The primary theoretical concept in her approach is the support-challenge combination of *guided participation:* "Guided participation involves adults or children challenging, constraining, and supporting children in the process of posing and solving problems—through material arrangements of children's activities and responsibilities as well as through interpersonal communication, with children observing and participating at a comfortable but slightly challenging level" (p. 18).

The basic processes of guided participation are universal. In all cultural settings, parents and children must *bridge* to a mutual interpretation of a situation that allows *intersubjectivity,* or a common focus of attention and shared presuppositions (Rogoff, Mistry, Göncü, & Mosier, 1993). Thus, all parents use some measure of support and challenge: support to bolster children's attempts to master skills, and challenge to move children toward higher levels of mastery. Support and challenge must be skillfully proportioned by adults to help children avoid situations that are over- or underchallenging. For instance, support might be manifested by simplifying the structure of a task by breaking it down into subgoals, verbally relating new tasks to old ones, carefully following a child's gaze and attention, helping a child avoid frustrating obstacles, and so on. But as a child grows more skilled, the level of challenge could be raised by asking questions that seek more information, releasing some responsibility to the child, *not* intervening when children can be successful on their own, and so on.

A parent must carefully observe a child's cues to effectively guide participation: "Interactional cues—the timing of turns, nonverbal cues, and what each partner says or does not say—are central to the achievement of a challenging and supportive structure for learning that adjusts to the learner's changes in understanding" (Rogoff, 1990, p. 104). A child might explicitly ask for more or less help, or signals could be implicit, involving a look, a gesture, listlessness, or gaze aversion. A number of studies reveal sensitive adjustment in action. For instance, effective tutors hypothesized what was the best level for intervention, and then modified their hypotheses based on students' reactions (Wood & Middleton, 1975). Mothers assisting 6- and 9-year-old children on a classification task began by giving redundant verbal and nonverbal information; as the session continued, however, their use of redundancy decreased and only reappeared when children showed difficulty or hesitation in solving problems (Rogoff & Gardner, 1984). Finally, similar moment-to-moment dynamics were evident even at the university level when experts tutored students in the fields of chemistry, physics, computer science, and mathematics (Fox, 1988a, 1988b).

The benefits of guided participation emerge from maintaining a child/learner in the *zone of proximal development* (i.e., where the child is challenged slightly beyond his or her skill level, yet is capable of mastering the challenge with the help of a more skilled partner; see Vygotsky, 1978). According to Rogoff, this zone represents a "dynamic region of sensitivity" where development occurs, and the skills of a culture are passed from one generation to the next. From a phenomenological perspective, we would add that a child's subjective experience within this zone is very close to the more optimal, intrinsically rewarding flow experience. In the zone of proximal development, challenges are slightly higher than skills, and the person experiences the slightly unpleasant state of *arousal,* which will change into flow if the person develops the next level of skills (Csikszentmihalyi & Rathunde, 1993). Our experiential perspective suggests that it is the attraction of flow that spurs the child to make these adjustments.

A number of studies confirm that guided participation is beneficial for children's development. For instance, it has been linked to infants' and toddlers' communicative competence (Hardy-Brown, Plomin, & DeFries, 1981; Olson, Bates, & Bayles, 1984), to improvement in children's seriation skills (Heber, 1981), and to greater exploration of novel objects by 3- to 7-year-olds (Henderson, 1984a, 1984b). Wood and Middleton (1975) found that when mothers tailored their instruction to their children's needs (i.e., guiding at a slightly challenging level, adjusting their instruction to children's successes), children performed more effectively on a task of building block pyramids. Interestingly, the number of interventions a mother made did not relate to performance; rather, it was the quality of the interventions that was effective.

While guided participation is a universal process, there are important variations across cultures in the goals that are valued and the means to their attainment: "A major cultural difference may lie to the extent to which adults adjust their activities to children as opposed to the extent to which children are responsible for adjusting to and making sense of the adult world" (Rogoff et al., 1993, p. 9). The former, *child-centered* pattern emphasizes parental accommodation to a child's level by joining the child in play, treating the child as a conversational peer, and so on. Such is the pattern described in the studies cited earlier, and it is the typical pattern manifested in middle-class families in the United States: "In the middle-class populations that have been studied, the bridge between adults' and children's points of view is often built from children's starting point, with adults building on children's perspectives by focusing on children's direction of attention and adjusting adult concepts to reach children's understanding" (Rogoff et al., 1993, p. 19).

When children are more embedded in the everyday lives and work environments of adults, they are responsible for accommodating to adults through observation and emulation. In this *adult-centered approach,* a child might be expected to speak when spoken to, reply to questions, or simply carry out directions, with adults providing helpful feedback in response to the child's efforts. This pattern has been observed in a variety of non-Western cultures such as in Kaluli, New Guinea, and Samoa, where children were expected to adapt to normal adult situations (e.g., caregivers modeled unsimplified utterances; Ochs & Schieffelin, 1984). It has also been observed in some African American communities where children were not encouraged to initiate dialogue with their elders and held their parents' attention longer when remaining silent (Ward, 1971), and in Eastern cultures, such as Japan, where parents stressed children's roles as apprentices to more experienced members of the community (Kojima, 1986).

The goal of parenting in Polynesia, according to Martini and Kirkpatrick (1992), is to turn children into *'enana motua,* or "parent persons." To achieve this goal, socialization revolves around teaching children how to become competent householders and establish and maintain familiar relations at home, away from home, and in the broader community—while maintaining autonomy in a dense network of binding relationships. This complex balance between group participation and autonomy is further reinforced by the culture, starting with peer interaction among children (Martini, 1994).

Rogoff and her colleagues (1993) argue that people from differing communities could benefit by synthesizing child-centered and adult-centered patterns of socialization. For instance, the child-centered approach in the West is thought to have benefits for developing the "discourse of schooling," whereas the adult-centered approach helps to develop children's observational skills. By encouraging skills of observation, the adult-centered approach might help Euro-American children to better coordinate their actions with others in a group; the child-centered approach, in turn, could help traditional communities, and some minority communities in the West, to access educational opportunities that open doors to Western institutions, which rely on assertive individuality.

Parenting in Infancy

A great deal of work on parenting in infancy helps to elaborate the theoretical dynamics under discussion. For instance, Field (1985, 1987) has suggested that whereas infants are born with genetic predispositions that make them differentially responsive to stimulation in the environment (e.g., Eysenck, 1973; Freedman, 1979; Izard, 1977), mothers who learn their infants' stimulation and arousal modulation needs, *and who match their behavior accordingly,* provide optimal contexts for the development of secure attachment and self-regulation (see also Lewis & Rosenblum, 1974). So a mother modulates her behavior to match her child's need for stimulation or comfort, thus helping the child to maintain an optimal level of arousal. Under normal circumstances, mothers and infants even achieve a synchrony in their behavioral and physiological rhythms (Brazelton, Koslowski, & Main, 1974; Field, 1985; Stern, 1974).

When a mother fails to stimulate or comfort a child in appropriate ways, the child may withdraw from interaction, show gaze aversion, negative affect, elevated heart rate, or other disturbances; such infants, when hospitalized and removed from under- or overstimulating environments, often show improvement (Field, 1987). However, if a mother *consistently* fails to develop a synchronous pattern that fits her child's needs, the child can experience behavioral and psychological disorganization, making him or her vulnerable to a number of later developmental problems. For instance, relationships have been reported between early interaction disturbances and school-age behavioral and emotional problems, including hyperactivity, limited attention span, and disturbed peer interaction

(Bakeman & Brown, 1980; Field, 1984; Sigman, Cohen, & Forsythe, 1981).

Some infants (e.g., a preterm or Down syndrome baby) may be "harder to read" in terms of their arousal needs, but parents typically adapt and do a better job than strangers. Interaction coaching studies have also shown that parents can learn to be more sensitive interactive partners. For instance, when asked to mimic their infant's responses, mothers become less active behaviorally and more attentive to their infant's cues; in contrast, when asked to keep their infant's attention, they are less sensitive to infant cues and more active behaviorally (Clark & Seifer, 1983; Field, 1977). The former coaching technique therefore enhances a child-centered approach to parenting, and the latter technique encourages an adult-centered approach.

Intersubjective perspectives are also at the front line of attachment research (Bretherton, 1987). Attachment theory suggests that infants and parents are genetically prepared for mutual negotiation and cooperative action (Bowlby, 1969; for contrasting perspectives see Gottlieb et al., Chapter 5; Thelan & Smith, Chapter 6, this *Handbook,* this volume; Trevarthen, 1979), and that even newborn infants are capable of experiencing a sense of emergent self-organization (Stern, 1985). What is particularly useful about attachment research is the abundant empirical and theoretical work that has addressed how early interactions affect later child development. Attachment researchers hypothesize that the quality of the early caregiver-infant interactions affects how children interpret their worlds through the development of a *working model* (see discussion later). Thus, basic styles of relating to the world are thought to be fundamentally connected to the interactive characteristics of early caregiver-infant interactions.

The term *attachment system* refers to a coherent behavioral-motivational system that is organized around a particular figure (or figures). Bowlby (1969) observed that the attachment system was *activated* by perceived danger and *deactivated* by safety. Bretherton (1987) contends that it is more helpful to think of the system as *continually active,* because this clarifies two distinct attachment phenomena: use of the caregiver as a safe base when there is perceived danger, and use of the caregiver as a launching point for exploration. Bretherton's conceptualization allows the attachment system to be seen on a continuum with other optimal arousal models discussed in this chapter. And like the other models discussed, the attachment system combines two "antithetical" human propensities: to seek continuity (comfort) in the face of overwhelming change, and change (stimulation) in the face of numbing continuity.

It is not surprising that a support/challenge combination is also recognized as the most effective way to parent infants. *Secure attachment* is associated with caregiving that is supportive when it needs to be, yet challenging in terms of encouraging exploration and autonomy.[10] Such a balance helps create the synchronous patterns associated with secure attachment (Isabella & Belsky, 1991), such as those observed in feeding situations, face-to-face interactions, responses to crying episodes, and many other types of interactive behaviors (Ainsworth & Bell, 1969; Bell & Ainsworth, 1972). Asynchronous patterns leaning toward over- or understimulation, alternatively, have been associated with insecure attachment patterns (Isabella & Belsky, 1991).

Because of the dependence of human infants on their caregivers, the latter have enormous influence on the patterning of intersubjective relations during the 1st year of life. Attachment theory suggests that from these relations children develop an internal working model of how the world works. Such a model serves a functional purpose: It represents reality as it is experienced and therefore allows the utilization of past experience to imagine alternatives and make decisions (Craik, 1943). In an evolutionary perspective, working models provide a survival advantage to the extent that they permit more insightful and adaptive behavior (Johnson-Laird, 1983). The adaptiveness of a model depends on its correspondence to the actual world (i.e., what is represented has to simulate relevant aspects of the environment); the more complex a working model is, the more flexible are an organism's potential responses.

Based on interactions with a caregiver, a child learns essential information about how self and other are related, and this information becomes a template for future interpretations. Distortions or disturbances in the interactive relationship result in distortions in processing information; because working models become automatic and habitual, these distortions can lead to relatively stable maladaptive patterns of development. Stern (1985) makes the provocative suggestion that when mothers consistently "overattune" or "under-

[10] The attachment literature typically describes optimal parenting in terms of a child-centered approach. This is underscored by the fact that most attachment researchers view maternal insensitivity as a mother's inability to *take the perspective of a child* (Ainsworth, 1983).

attune" to infant cues, they can *undermine infants' ability to evaluate their inner states.* From an experiential perspective, this result would seriously undermine later abilities to evaluate boredom and/or anxiety and respond in ways that promote flow experiences.

Also relevant from an experiential perspective are studies that show attachment patterns have carryover effects that influence children's *style* of engaging activities. For instance, secure attachment at 12 months predicted more adaptive communication in a problem-solving task too difficult for 2-year-olds to perform by themselves. Securely attached infants tried to solve the problem independently, but turned to the mother for help when they got stuck; mothers, in turn, comforted their children and helped them to focus on the task (Matas, Arend, & Sroufe, 1978). Thus, the style of engaging the task reflected the style of interaction in a securely attached dyad (i.e., exploration in a context of support). It is also noteworthy that securely attached toddlers displayed more enthusiasm and task enjoyment.

In summary, several perspectives on parenting in adolescence, childhood, and infancy converge around the idea that parental combinations of support and challenge create optimal contexts for child development. A deeper recognition of such continuities across parenting studies is an important step toward more integrative theories of child development. One of the most important areas to explore, we believe, is how the system flexibility created with combinations of support and challenge affect children's subjective experience and their emergent capacity to self-regulate arousal. Studies in each of these areas inform the phenomenological perspective in this chapter. Combinations of parental support and challenge were associated with adolescents' reports of flow experience in school (Rathunde, 1996, 2001a), children's engagement in the zone of proximal development (Rogoff, 1990), toddlers' enthusiastic task performance (Matas et al., 1978), and infants' optimal arousal (Field, 1987). Common to all the perspectives reviewed was an emphasis on children's development through intersubjective experience in the family; the historical roots of this perspective can be found in Baldwin (1906), Cooley (1902), Mead (1934), and Vygotsky (1962).

Teacher-Child Interaction and the Growth of Complexity

School contexts, like family contexts, play a fundamental role in socializing children and facilitating their development. If it is true that the flexibility of supportive and challenging families facilitates the interconnection of immediate and voluntary uses of attention and, therefore, children's ability to find optimal experience, then it is reasonable to assume that the same applies to school contexts. A challenging school environment would activate students' accommodative efforts (i.e., voluntary attention) to reorganize their thinking, acknowledge new points of view, formulate new plans, and so on. A supportive school environment would sustain students' assimilative habits (i.e., immediate attention) of exploring the world from their own point of view, using their imagination as a bridge to new experiences, and feeling comfortable and effective. Support and challenge in a school environment would therefore create a flexible social system with the ideal conditions for "full" attention or bidirectional attention that can maintain students' optimal arousal and facilitate the ongoing transformation of challenges and skills.

Education philosophies can be at odds concerning the value placed on these two different aspects of learning. For example, contemporary concerns about increasing student achievement (e.g., a back-to-basics orientations, increased emphasis on performance and standardized testing) tend to emphasize a student's need to accommodate others' points of view as represented by teachers and/or texts. Adults *present* challenges, and students are expected to work hard to integrate the new information. Such approaches place a high value on the use of what we have been calling voluntary attention, or modes that have traditionally been referred to as "objective," rational, or conceptual. William James referred to this knowing as "knowledge about" (Taylor & Wozniak, 1996). In contrast, and coinciding with a greater attentiveness to child development and a recognition of children's constructive powers, several education philosophies emerged in the twentieth century that placed a greater emphasis on students' intrinsic motivation to learn. These approaches emphasized learning from the inside out, so to speak, and are often connected with Dewey's progressive movement in education (Semel & Sadovnik, 1998). They place a higher value on what we have been calling immediate attention, or modes that have typically been described as more "subjective" or intuitive. Taylor and Wozniak (1996) note that James sometimes referred to this knowing as perceptual; experience was direct and immediate and "there is no separation of knower and known" (p. xvii). Teachers who place an emphasis here

would expect students to *discover* challenges that would lead them forward toward greater knowledge.

Our perspective, as is clear from the many examples of psychological complexity, is that both uses of attention are needed to transform the other. Following James and Dewey, both of whom recognized this dilemma, when one mode is disconnected from the other, the process of knowing breaks down with deleterious consequences. James (1904) commented, "Knowledge thus lives inside the tissue of experience. It is *made;* and made by relations that unroll themselves in time" (pp. 539–540). When separating out parts of experience with voluntary or selective attention, the tissue must remain intact and the parts of experience that are highlighted must find their place again in relation to the ongoing stream. In this way, James thought that knowledge was neither subjective nor objective, but when understood as a function or process, it was both at once. Likes James, Dewey had a mistrust of purely rational analyses. His progressive movement was a reaction against the "intellectualist fallacy" that equated the real exclusively with conscious knowledge "about" something (Kestenbaum, 1977). Unfortunately, Dewey's philosophy of experience was misunderstood or ignored on this point. He was often seen, as many others were who were associated with the progressive movement, as proposing an "easy," laissez-faire form of education that paid too much attention to children's interests. Dewey's philosophy rightly understood, however, mirrors James on the interconnection of subject and object and immediate and voluntary attention. This is clear, for instance, in Dewey's (1934/1980) description of a "complete" or aesthetic experience (i.e., the ideal model for ordinary experience): "Art celebrates with peculiar intensity the moments on which the past reinforces the present and in which the future is a quickening of what now is" (p. 18). Aesthetic experiences were an intensification of the basic rhythm of subjective and objective phases of thought, and this intensified rhythm is experienced as a powerful stream or flow of experience.

Schools, or individual teachers, that overemphasize either a teacher-directed, abstract/conceptual approach or a student-directed, concrete/intuitive approach can sometimes be effective, but only because the underemphasized component of attention operates regardless of the explicit philosophy of the school. In other words, the stated philosophy may reinforce and acknowledge one direction, but learning can only take place through the interrelation of immediate and voluntary modes. Therefore, the "missing" use of attention operates like an unannounced guest in the school: Teachers using outside-in approaches don't give enough credit to student imagination and intuition that meet teachers or textbooks halfway; teachers who believe in inside-out approaches may fail to acknowledge that rational and abstract thinking is a necessary component for maintaining enthusiastic student interest in a subject. Such one-sided approaches would be more effective if the educational philosophy recognized the dynamics of optimal arousal and the need for immediate and voluntary attention to work in concert to appropriately transform anxiety and/or boredom.

The biggest experiential problem created by teachers who always present challenges is that they inevitably introduce new information that fails to properly connect with the skill levels of students; they introduce a feeling of anxiety, therefore, that becomes difficult to turn into optimal arousal. For example, if students are presented with a challenge that lacks meaning for them, or overshoots their skills and capacity for mastery, they are unable to engage the challenges with the immediate confidence that a practiced and habituated set of skills would provide. In this situation, anxiety can only be "resolved" with drudgery; students go through the paces using the tools given to them and doing what they are told. Learning is compromised by a disruption in the stream of experience and the disconnection of immediate and voluntary uses of attention. Alternatively, the experiential impasse created by teachers who are always letting students discover challenges is that the challenges selected may not be sufficiently novel enough to propel a change in students' existing skills; the resulting feeling of boredom becomes difficult to shed and turn into optimal arousal. For example, student's may select "challenges" that do not move them out of immediacy and evoke effort and voluntary attention. In this equally negative learning environment, boredom is "overcome" with what Dewey called fooling; students distract themselves with unimportant diversions. Again, the stream of experience is disrupted due to the disconnection between concrete and abstract uses of attention; this disconnection, in turn, does not allow the accelerated rhythm of thought that is subjectively experienced as flowlike.

How school environments that lacked the right balance of support and challenge could tear the tissue of experience was illustrated by our study of talented teenagers (Csikszentmihalyi et al., 1993). One part of the study looked at student experience and talent devel-

opment in the arts (i.e., athletics, music, and visual arts) versus the sciences (i.e., mathematics and science). According to the students we interviewed, the former domain was often perceived as student-centered: Teachers were highly supportive and encouraged students to discover challenges, take initiative, be intrinsically motivated, and so on. In contrast, math and science classes were more often perceived as adult-centered: Teachers presented challenges, were not perceived as particularly caring or supportive, required student compliance, and instilled extrinsic motivation with an emphasis on grades and performance. The prevailing emphasis in the school context was related to specific impasses in student experience. For example, students in the arts showed an ESM pattern of fooling. They often felt a momentary sense of ease and enjoyment with respect to what they were doing in class when signaled by the pager (e.g., they reported above average moods and involvement at the moment); but they could not see how what they were doing was truly important (e.g., they reported below average relevance to their goals and future). In contrast, students in the science classes reported a drudgery pattern. When they were signaled, students reported that they could see how their activities were relevant; but they reported below average involvement at the moment. Those students who went on to develop their talents the farthest by the end of high school—*across all of the talent areas* —more often reported immediate engagement *and* a focus on important future goals (Rathunde, 1993, 1996, 2001a). Consistent with such full attention to their school tasks, they also reported more frequent flow experiences.

The earlier scenario is played out in many school contexts around the country each day. Our interpretation is that it results from one-sided philosophies that pit against each other the value of teacher versus student direction, challenge versus support, and conceptual versus intuitive thinking. Applying what we have learned about optimal experience to education leads us to believe that such dichotomies end up emphasizing voluntary effort at the expense of momentary involvement, or immediate involvement at the expense of voluntary effort. The former is more associated with authoritarian/rigid tendencies in the school environment (i.e., high challenge with low support) and the former with more permissive/disorganized school environments (i.e., low challenge and high support). Just as we argued with respect to family contexts, each of these particular imbalances of support and challenge reduce flexibility in the assimilation and accommodation dialectic, make it more difficult for students to negotiate a good person-environment fit, and by slowing down the ideal rhythm of mental activity they reduce the likelihood of experiencing flow. More important, repeated experience in environments that lack system flexibility (Bronfenbrenner, 1992), is likely to result in the formation of self-regulative habits that work against the development of psychological complexity and the ability to turn aversive experiences like boredom and anxiety into flow. A clearer recognition of these unfortunate but familiar patterns in many school environments would be an important step toward a more inclusive and experientially sensitive philosophy of education, one that was concerned about how characteristics of the school context affected the phenomenology of students and their emergent capacity to regulate their arousal.

Students' Quality of Experience in Middle School: A Comparison of Montessori and Traditional School Environments

The middle school transition is one of the key points during child development. It has been well documented that many young adolescents have difficulties with the transition to middle school (Carnegie Council on Adolescent Development, 1989; Eccles et al., 1993). One finding that is particularly relevant to this chapter is that there is a drop in students' intrinsic motivation to learn (Anderman, Maehr, & Midgley, 1999; Gottfried, 1985). As most teachers can attest, during the elementary grades many children are enthusiastic about learning. However, middle school too often brings a decline in motivation and the quality of school experience.

Eccles and her colleagues (1993) explain these declines by suggesting that the middle school transition can result in poor fit between an adolescent's developmental stage and the school environment. They cite several aspects of this growing mismatch: fragmented class content when young adolescents are capable of more sophisticated cognitive integration; more rigid, control-oriented teachers and environments when identity, choice, and autonomy are becoming more important in the lives of young people; and an emphasis on public evaluation and competition at a time when students are feeling self-conscious and "on stage." Adolescents are also more peer-oriented and at a stage crucial for the development of interpersonal skills; yet, many middle school teachers increasingly rely on top-down, lecture approaches that make it difficult for students to collaborate

during class time (Wentzel, 1998). Finally, at a time of stressful and rapid development change, when students need continued adult support, teacher-student relationships become more remote and impersonal (Feldlaufer, Midgley, & Eccles, 1988).

Our perspective is consistent with the studies discussed earlier; however, it shifts the emphasis to how middle school changes might affect students' experience and potential for optimal experience. Many middle schools make the mistake that some of the science classes made in our study of talent development. The balance of support *and* challenge is shifted in favor of the latter, leading to more rigid and authoritarian school environments. Learning becomes more adult-directed: Teachers present the challenges, increasingly stress grades and performance, and are not as interpersonally supportive. Such changes are initiated with the best of intentions. Academic achievement is highly valued in our culture, and the commonsense understanding of such achievement, especially in the technologically important domains of math and science, suggests that it is based on abstract and conceptual thought, not concrete and intuitive "feelings." Thus, as students' powers of abstraction and deductive reasoning grow with puberty (Piaget, 1962), teachers, school administrators, school boards, and state legislatures turn toward pedagogical methods that, at face value, seem to fit the task at hand. Unfortunately, these changes introduced in the school context are often self-defeating. As explained earlier, more authoritarian social contexts affect how immediate and voluntary modes of attention work in concert. From an experiential perspective, the changes introduced in middle school are likely to promote voluntary effort at the expense of immediate involvement, reduce flow because the interplay of these modes is impeded, and therefore reinforce a pattern of student drudgery. Although not focused on experiential outcomes, most of the research done to date on the middle school transition would be consistent with such an interpretation.

A more compatible environment for young adolescents, we believe, would be one that placed a greater importance on students' quality of experience and emergent capacity to regulate their arousal for the purposes of lifelong learning. Such an environment would place a high value on support and challenge to create a degree of system flexibility that enhanced the assimilation and accommodation dialectic and thereby the intensity of mental activity that would more often lead to flow. To explore these ideas, a recent study compared students' quality of experience in Montessori and traditional middle school classrooms (e.g., Rathunde, 2001b; Rathunde & Csikszentmihalyi, 2005a, 2005b). The Montessori educational philosophy, in theory, has many of the qualities just described that would enhance adolescent experience. Although it is mainly associated with thousands of schools worldwide that specialize in early childhood education, over the past several decades the approach has increasingly been incorporated into middle schools, both public and private.

The Montessori philosophy shares with optimal experience theory a phenomenological focus on states of deep concentration and intense engagement. This is illustrated by the origins of the method. Maria Montessori came to believe that children's spontaneous concentration revealed the essence of being human. What she had in mind when speaking about concentration was akin to flow. According to Standing's (1984) biography of Montessori, a key turning point in the development of her method occurred after observing a 3-year-old child who was so engaged with wooden cylinders that she could not easily be distracted. Montessori was impressed with children's powers of concentration and spoke of it often: "It has been revealed that children not only work seriously but they have great powers of concentration. . . . Action can absorb the whole attention and energy of a person. It valorizes all the psychic energies so that the child completely ignored all that is happening around him" (Montessori, 1946, pp. 83–84). Witnessing the episode with the wooden cylinders apparently evolved into the main theme of the Montessori method: creating a school environment that fostered deep engagement and concentration.

A second important way in which the Montessori educational model fits with optimal experience theory is the emphasis placed on lifelong learning, rather than short-term performance. Through her concept of "normalization," Montessori tried to capture the personality characteristics and flexibility of attention that would result in self-directed learning. Similar to the notion of psychological complexity, normalization would result in adaptability to the environment and the ability to negotiate a person-environment fit: "Adaption to the environment and efficient functioning—therein is the very essence of a useful education." A "normalized" child would be on the road to recurrent episodes of deep concentration, and this would put them in contact with the essential motivational forces of human nature that

would help sustain lifelong learning. Also similar to the concept of psychological complexity, normalization depended on uniting what she called two important streams of energy—body and mind—so that abstraction did not become an end in itself. Standing (1984) commented, "More than in any other system of education, her whole method is based on a deep understanding of the relationship between these two elements—mind and body" (p. 159). Montessori most often referred to the protective function of the mind-body connection in terms of thinking and acting. She (1976) commented, "It is essential for the child, in all periods of his life, to have the possibilities of activities carried out by himself in order to preserve the equilibrium between acting and thinking. . . . [otherwise] His thoughts could . . . have the tendency to lose themselves in abstraction by reasoning without end" (pp. 24–25).

A third important way in which the Montessori philosophy parallels our views on education relates to the context of optimal experience. The fundamental question asked about context is the same in both approaches: If one assumes that a key to the path of lifelong learning is recurrent states of intrinsically motivated concentration, *then how can adults prepare an environment for children that facilitates the occurrence of deep concentration and flow?* Montessori's (1989) answer to this question was conveyed in her notion of the *prepared environment,* which shares two important similarities with optimal experience theory. First, a prepared environment must have a balance of support and challenge, or in Montessori's terminology, a balance of freedom and discipline. Montessori understood that freedom of choice was a precondition for concentration; however, she never lost sight of the opposite and equal need for order, structure and discipline in the environment. She commented (quoted in Standing, 1984), "On this question of liberty . . . we must not be frightened if we find ourselves coming up against contradictions at every step. You must not imagine that liberty is something without rule or law" (p. 286). Second, because the environment is conceptualized from an experiential starting point, a teacher in the Montessori prepared environment pays special attention to a student's ongoing quality of experience. A priority is placed on finding activities that engage interest and fit with a student's developmental level, maintaining an orderly and aesthetically pleasing environment so as to eliminate unnecessary distractions, and working, often in an indirect way, to protect and enhance a child's focus and concentration (see also Rathunde, 2001b).

The study compared five Montessori schools and six traditional schools that were carefully matched in terms of SES and other important school and family variables. The main differences between the schools were their pedagogical approaches. The school contexts in five Montessori middle schools were more in line with the experiential perspective articulated here and the reforms suggested by many contemporary education researchers (e.g., Ames, 1992; Anderman et al., 1999). For example, they were imbued with a philosophy of intrinsic motivation, students had freedom to select projects and improvise on themes introduced by the teacher (e.g., students at all the schools had several hours per day for self-directed projects), students were given responsibility to make decisions that affected their classrooms and the school (e.g., purchasing supplies), achievement competition was diminished and grades were not mandatory, students were typically grouped based on shared interests rather than ability, a significant portion of daily time was unstructured and could be used for peer interaction and collaboration, and block scheduling at some of the schools allowed teachers to expand or contract contact time with students depending on what was happening at the moment in the classroom.

The ESM provided a systematic look at students' daily experiences. Results showed (Rathunde & Csikszentmihalyi, 2005a, 2005b) that the Montessori students reported higher affect, potency (i.e., feeling energetic), intrinsic motivation, and more flow experience while engaged in academic activities at school. When engaged in informal, nonacademic activities at school (e.g., eating lunch, socializing), the students in both school contexts reported similar experiences. The Montessori students also perceived their teachers as more supportive *and* better at maintaining order in the classroom (i.e., upholding discipline). Finally, the Montessori students spent more time doing self-directed individual projects, and they also more often perceived their classmates as friends and spent more time in collaborative work with them. The traditional middle school students spent more time in didactic educational settings (e.g., listening to a lecture, note taking, watching instructional videos).

One of the strongest findings in the study had to do with the connection between the use of immediate and voluntary attention. Recall that we expected the traditional middle schools to more closely resemble the

science classes in our study of talent development. Such teacher-directed environments that presented challenges, stressed grades, and lacked interpersonal support were hypothesized to emphasize voluntary effort at the expense of momentary involvement and thus lead to a pattern of drudgery at school. Our findings supported this expectation. When the students in the traditional middle schools responded to the ESM pager, they reported being able to see how their school activities were important to their goals, but they did not feel very involved at the moment with what they were doing. In contrast, the Montessori students reported much higher percentages of *undivided interest*—the simultaneous combination of felt involvement and perceived importance—while doing academic work.

Comparing educational contexts is a difficult enterprise that is full of empirical pitfalls. However, these initial studies show promise for conceptualizing school contexts from the point of view of student experience. Many public schools have drifted toward transmission models of top-down education and standards-based testing. The Montessori schools may have been able to avoid these trends because of a long-standing commitment to intrinsic motivation. Nevertheless, the principles of focusing on experience, creating the right balance of support and challenge, and so on, are not the province of any particular philosophy. The greater importance of these findings, therefore, should be seen in the context of the narrowing of perspective in the United States and other societies in the West that increasingly equate knowledge with a thin set of cognitive skills (Johnson, 1987; Lakoff & Johnson, 1999; Sternberg, 2001). To our way of thinking, such a narrowing makes it less likely that students will develop the habits of psychological complexity that, above all else, depend on the flexibility of attention and the integration of concrete and abstract ways of thinking.

Middle schools lie at a crossroads in adolescent development. It is a crucial developmental stage when mature abstract thought emerges with full force. Learning how to deal with these new cognitive powers make early adolescence a turning point when many things can go wrong; negative school experiences during this stage could affect the long-term educational path of young people (Anderman & Maehr, 1994; Csikszentmihalyi & Schneider, 2000; Eccles, Lord, & Midgley, 1991; Sternberg, 2001). Positive experiential habits formed in early adolescence, alternatively, can set the stage for adult habits of psychological complexity and future career success.

NEOTENY AND COMPLEXITY: THE EVOLUTIONARY LOGIC OF UNENDING CHILDHOOD

Are the recurring themes in this chapter—the phenomenology of assimilation and accommodation, the balancing of skills and challenges, the intersubjective dynamics of support and challenge, and so on—just instances of a selective ordering of information, or do they reflect something intrinsic to human nature? We believe that the connections made thus far between complexity in later life and its foundation in child development have a deeper meaning that can be discerned in an evolutionary framework. In keeping with the strategy of moving from maturity to earlier developmental periods, we take one final step "back," so to speak, to an evolutionary perspective on neoteny.

Neoteny refers to the retardation of development, especially that of the nervous system, such that infants are born relatively immature and must learn what they need to know to survive (Gould, 1977; Lerner, 1984). Compared to other primates, humans are considered neotenous because their rate of development from fetus to adulthood is unusually slow. In fact, adult humans even retain many of the physical traits of the human fetus, such as flat-facedness and minimum body hair (Bolk, 1926). Huxley (1942) and others (e.g., Montagu, 1989) have suggested that neoteny "drives off" of the developmental timescale traits that have been a part of our evolutionary past (e.g., the heavier eyebrow ridges and projecting jaws of adult apes, of Neandertaloids). More important than the physical characteristics, Lorenz (1971) maintained that the behavioral outcomes of neoteny—the retention of childlike traits such as curiosity, playfulness, and flexibility, to mention just a few—are far more important. He concluded that the defining characteristic of humans was nonspecialization, allowing an *unending state of development* and an ability to change in response to new environments.

In his book *Growing Young,* Ashley Montagu (1989) concurs with this perspective and sums it up in the following ironic phrase: "The goal of life is to die young—as late as possible" (p. 5). He argues that we are biologically prepared by evolution to "grow young," or to emphasize rather than minimize childlike traits as we mature. Although the importance of these ideas are known by a small group of social and natural scientists, Montagu asserts that the enormous ramifications of an *applied understanding of neoteny* have yet to be fully recognized. Such an understanding would explicitly recog-

nize and nurture childlike traits, leading to adjustments in parenting and teaching philosophies; it would also redefine society as a system designed to extend the neotenous traits of humankind.

The universal manifestation of attachment processes provides deeper insight into the evolutionary logic of neoteny. Attachment discloses the fact that heavy parental investments in caregiving have a genetic underpinning (Bowlby, 1969), and that human infants and their parents are biologically prepared for intersubjectivity (Papousek & Papousek, 1987). Thus, parents and infants come equipped with the necessary skills for dialectic negotiations and joint meaning-making: "Humans are born with a self-regulating strategy for getting knowledge by human negotiation and co-operative action. . . . Thus socialisation is as natural, innate or 'biological' for a human brain as breathing or walking" (Trevarthen, 1988, p. 39).

The concept of neoteny thus provides a unifying link among various parts of this chapter. First, it provides a rationale for the presumed goal of complexity in later life, the defining characteristic of which was unending development due to flexibility (see also Lerner, 1984). The lifelong learners we interviewed can thus be seen as examples of the neotenous promise of human evolution. Second, the concept provides a way to link the idea of complexity with our observations about child development in social interaction. The trade-off in having a plastic versus fixed path of development is the enormous dependence that human children have on their parents (Gould, 1977; Lewontin, 1981). This dependence is illustrated by comparisons to other primates; humans give birth at a later age, have fewer young with each gestation, have longer gestation periods, lactate longer, and have fewer children across their lifetime (Altmann, 1989; Johanson & Edey, 1981). The human fetus is also expelled from the womb "early" because the evolution of brain size made premature birth necessary to permit safe passage through the birth canal (Montagu, 1989). This almost total dependence of human infants on caregivers, and the genetic predisposition to form attachments, explain why "individual" development occurs in a social process.

How does this slow and steady "tortoise strategy" lead to adult complexity? And what about this strategy is connected to optimal experiences that we claim are so important for development? These final questions of the chapter are addressed by taking a closer look at the *opportunity for play* afforded by neotenous development. Of the many consequences resulting from this basic human predicament of prolonged dependence, we believe play says the most about human development. Neoteny provides infants with ample time to play in a relatively *unpressured* context; Bruner, Jolly, and Sylva (1976) add that play was favored by evolution as a pressure-free time during which adult skills could be imitated with successful solutions *that lead to pleasure.* The phenomenon of play thus contains the evolutionary logic of neoteny; a closer look at its character reveals the essential connection among parental protection, optimal experiences, and the growth of complexity.

The Syntelic Character of Play

Baldwin (1906) has analyzed the character of play in a way that links it to the highest levels of human development. He refers to play as *syntelic* to capture its unique confluence of subjective and objective, inner and outer, characteristics:

> Both the inner freedom and the outer semblance must be retained [in play]; the latter gives consistency, pattern, dramatic quality, all that is meant by "semblance"; the former give control, selective character, essential inwardness. (p. 114)
>
> The play object becomes not the inner or fancy object as such, nor yet the outer present object as such, *but both at once, what we are calling the semblant object,* itself the terminus of a sort of interest which later on develops into that called "syntelic." (p. 116)

Baldwin is suggesting in these comments that play opens up the opportunity for make-believe against a background of reality (i.e., real sense objects); both of these qualities—an essential inwardness and an outer semblance—must be present. If there is no reference in play to the external world, it becomes pure fancy, and it loses its interest and drama. Alternatively, if play is too reality dependent or compulsory, it again loses its interest, but for a totally different reason. Play must retain its character of self-illusion, what Baldwin calls a "don't-have-to feeling," that invests the object with personal meaning, inner determination, and a feeling of self-control; to a certain extent, this quality *tempers* the external control that would otherwise hold. Thus, Baldwin (1906) states, "Play is a mode of reconciliation and merging of two sorts of control. . . . For it provides for the relative isolation of the object and opens the way for its treatment by experimentation" (p. 119).[11]

[11] Analogously, one can think of the scientific process as syntelic, as an oscillation between theoretical (subjective) and empirical (objective) modes of "control."

It is the syntelic character of play that makes it crucially important and links it to higher forms of human thought. By allowing the oscillation between subjective and objective modes, Baldwin perceives a developmental link to the emergence of basic human dualisms (e.g., mind/body, self/other, truth/falsity) and the eventual *overcoming* of such dualisms with full development. The legacy of play can thus be seen in the syntelic character of Baldwin's highest form of thought: aesthetic contemplation. Like John Dewey's (1934/1980) comments on aesthetic experience, Baldwin's descriptions of aesthetic modes are remarkably close to contemporary perspectives on postformal thought processes, and to our remarks on flow experience: "In aesthetic experience the partial insights of intelligence and feeling are mutually conserved and supplemented" (1911, p. 279). His perspective, though, adds insight to the developmental history of such outcomes; in other words, play is germinal to the highest forms of human thought as its syntelic character is elaborated and reinstated on higher levels of organization.

The essential benefits of playing lie in the manipulation of information in a pressure-free context that is informed by external and internal determinants, but controlled by neither. Play can retreat from compulsion and the "have-to" state of mind, or escape from the irrelevance of a "don't-have-to" consciousness. Thus, play captures the same self-environment synchrony we described in flow experiences; in addition, the dynamics of both are similar. Berlyne (1960, 1966), for instance, viewed play as serving a stimulus-seeking function when the organism was bored and an arousal-decreasing function when the organism was anxious. Other theorists have emphasized the positives of one or the other function; for instance, Ellis (1973) viewed play as stimulus seeking, and Freud (1959), Vygotsky (1962), and Erikson (1977) thought of play primarily as a safe way to reduce tension by dealing with problems in a symbolic way.

Also, like flow, play results in the differentiation and integration of the self. When it is exploratory, it generates novelty (Fagen, 1976); when it is imitative (or repetitive), it builds habits (Piaget, 1966). Vandenberg (1981) likened these differentiating and integrating aspects of play to the functions of genetic mutation and DNA, respectively, in providing for biological diversity and continuity. Play may be no less important in providing for cultural diversity and continuity. A number of theories have drawn connections among play and human creativity, achievement, and flexibility (Bruner, 1972; Rubin, Fein, & Vandenberg, 1983; Sutton-Smith, 1976). One of the strongest statements on the importance of play is given by Huizinga (1955), who saw it in the roots of our cultural institutions.

In conclusion, neoteny is connected to play through the establishment of an optimally stimulating context that is free of survival pressure due to parental investments of energy. Groos (1901) notes from an evolutionary perspective that *this period of human immaturity exists precisely for the purpose of play,* and there is a correlation between the length of play and an organism's eventual complexity (see also Gould, 1977; Johanson & Edey, 1981; Lerner, 1984; Lewontin, 1981). When flow experiences are seen on a continuum with play (i.e., as play reinstated on adult levels of organization), Groos's formula can be extended to flow experiences; in other words, *to the extent that adults continue to have flow experiences, their lives reflect a neotenous pattern of unending development.* This observation is consistent with our earlier examples of complexity in later life: These individuals regulated their attention in ways that promoted flow experiences and maintained the ability to "play" in adulthood.[12]

Much can be learned about the development of the person by better understanding the social conditions that take advantage of a neotenous developmental pattern. Important clues about these conditions can be found in the attachment relationship between caregiver and infant. Unless otherwise plagued by problems of their own, parents are prepared by evolution to create a play space through adjustments of support and challenge that helps infants to regulate their arousal. It is not a coincidence, we believe, that optimal developmental outcomes in infancy, childhood, and adolescence are all associated with parental combinations of support and challenge; such combinations—to the extent that they create appropriate conditions for optimal experiences—are consistent with the evolutionary logic of neoteny. Thus, future studies that continue to uncover how families (or other contexts of socialization) facilitate optimal experiences and outcomes will inform the creation of social environments that are more consistent with our biological potentials.

Another area of research from which much can be learned about unending development is the study of suc-

[12] In Baldwin's terminology, to "play" in adulthood means having *aesthetic experiences* that allow the reconciliation of the various partial truths (e.g., feeling and intellect, inner and outer). Dewey (1934/1980) likewise thought that aesthetic experiences reconciled feeling and intellect.

cessful aging. The examples of complexity used in this chapter illustrate that it is worthwhile to ask lifelong learners how they were able to stay interested and involved. Much research, however, remains to be done. Do "protective" social conditions still play a role in facilitating optimal experiences in late adulthood? How much of this regulatory function is (or can be) taken over by individuals through the internalization of supportive and challenging conditions they have experienced in their lifetimes? While the focus in this chapter has been on the individual's responsibility for negotiating optimal experience, it is certain that social conditions remain important. For instance, many of those we interviewed had the benefit of tenured or emeritus positions on a faculty; many had extremely devoted spouses, and most seemed free from financial worries. Further studies of successful aging can shed light on how personal instigative qualities, and social conditions, work to maintain the promise of neoteny. To the extent that insights gained are linked to child development, including the earliest moments of parent-child interaction, developmental theory will benefit greatly.

CONCLUSIONS: THE ROLE OF EXPERIENCE IN DEVELOPMENT

Theories of development have tended to look at the individual as an organism propelled along the life course by external forces. From conception to death, individuals were seen as dependent variables who were a function of a host of independent variables: genetic programs, early environments and stimulations, social and cultural contexts. In opposition to such overly deterministic perspectives, recent approaches have emphasized the active, purposeful role of the individual in helping to shape his or her developmental trajectory (e.g., Brandtstädter, Chapter 10; Bronfenbrenner & Morris, Chapter 14; Magnusson & Stattin, Chapter 8, this *Handbook,* this volume).

Our experiential perspective on the developing person fits in this latter approach. It recognizes the fact that human beings come into the world exceptionally immature and must depend on a supportive social context to develop their full potentialities. The social context, in turn, expects the growing individual to display certain minimum competencies before he or she can be accepted as a "person." In addition, each culture evolves expectations of optimal personhood that serve as the ideal goals of individual development. Despite the fact that how a person develops may vary greatly across time and place, adopting an experiential perspective highlights the basic human disposition to regulate arousal that begins with the first moments of life. Common to the many manifestations of personhood across cultures, therefore, is an experiential dialectic that attempts to maintain and cultivate optimal arousal. Psychological complexity is the name we have chosen to represent the mature ability to flexibly regulate arousal and optimal experience. A person with complexity has the capacity to move toward flow experience by negotiating a self-environment fit that is integrated and differentiated, or a fit that achieves an optimally arousing balance of order and novelty. It is reasonable to believe that such a person will more often enjoy the full engagement of attention and be living at what James (1917) called their "maximum of energy." Having such energy and attention at their disposal provides a greater capacity to actualize full potential.

What propels the development of flexible self-environment negotiation and complexity? Although the specific construct of complexity is not commonly used, many developmental theories address the conditions that favor the development of a person who has the capacity to instigate their own development. Many of these theories have been mentioned in this chapter. However, few of them look at the *proximal* causes for the emergence of self-regulation, or adopt a phenomenological approach that monitors the moment-to-moment uses of attention and feedback through experience that guides regulation and decisions to engage new challenges and develop new skills. In addition, few developmental theories focus on deeply involving states, like flow, that reveal all is well with arousal regulation and that development is on a positive track. We have tried in this chapter to conceptualize optimal development using such optimal experiences as a starting point.

So the central pragmatic question for development becomes: How do we help children learn to enjoy as many aspects of their lives as possible? How do we create contexts that will help children develop complexity? Our answer is based in the habits and dispositions that result from repeated experience in family and school contexts that are entrusted with the primary job of socializing children. A child who is overwhelmed by too many and too difficult opportunities, or who has learned to respond with apathy and indifference to an environment that lacks stimulation, might never learn to enjoy the active shaping of his or her experience. Alternatively, practice and repeated success in

environments that facilitate optimal arousal will develop the capacity for psychological complexity. We have argued that supportive and challenging family and school contexts help in this regard because they are sensitive to the balance of children's skills and challenges, and therefore to the interconnection of immediate and voluntary modes of attention that must work together to transform anxiety and/or boredom. Although this perspective is still being developed and is not yet based on extensive empirical examination, we have reported the results of several studies that hold promise for understanding how social contexts affect the interconnection of these two modes and therefore the likelihood of optimal experience.

If experiential considerations are ignored when attempting to understand positive self-regulation and development, we miss the fact that to become active agents in their own ontogeny, individuals have to *want* to develop. And they will want to do so only if they enjoy it. If they do not, development becomes alienating because the child as well as the adult learn and grow primarily for extrinsic reasons. The child will study to graduate from school, the adult will work to get a paycheck and be promoted, and both will endure their present conditions listlessly in anticipation of a more pleasant future. This is not a developmental trajectory that leads to complexity or a desirable old age. By contrast, development takes an intrinsically motivated course if a child feels fully engaged and fully present while learning and engaging new challenges. Habits developed in the successful regulation of optimal arousal are ones that form a solid basis for lifelong learning.

REFERENCES

Adlai-Gail, W. S. (1994). *Exploring the autotelic personality.* Unpublished doctoral dissertation, University of Chicago, IL.

Adler, M. J. (1927). *Dialectic.* New York: Harcourt.

Ainsworth, M. D. S. (1983). Patterns of infant-mother attachment as related to maternal care: Their early history and their contribution to continuity. In D. Magnusson & V. L. Allen (Eds.), *Human development: An interactional perspective* (pp. 35–55). New York: Academic Press.

Ainsworth, M. D. S., & Bell, S. M. (1969). Some contemporary patterns in the feeding situation. In A. Ambrose (Ed.), *Stimulation in early infancy* (pp. 133–170). London: Academic.

Altman, I. (1975). *Environment and social behavior* Monterey, CA: Brooks/Cole.

Altman, I., Vinsel, A., & Brown, B. (1981). Dialectical conceptions in social psychology: An application to social penetration and privacy regulation. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 14, pp. 107–160). New York: Academic Press.

Altmann, J. (1989). Life span aspects of reproduction and parental care in anthropoid primates. In J. Lancaster, J. Altmann, A. Rossi, & L. Sherrod (Eds.), *Parenting across the life span: Biosocial dimensions* (pp. 15–29). New York: Aldine de Gruyter.

Ames, C. (1992). Classrooms: Goals, structures, and student motivation. *Journal of Educational Psychology, 84,* 261–271.

Anderman, E., & Maehr, M. L. (1994). Motivation and schooling in the middle grades. *Review of Educational Research, 64,* 287–309.

Anderman, E., Maehr, M., & Midgley, C. (1999). Declining motivation after the transition to middle school: Schools can make a difference. *Journal of Research and Development in Education, 32*(3), 131–147.

Apter, M. (1989). *Reversal theory.* London: Routledge & Kegan Paul.

Arnheim, R. (1971). *Entropy and art: An essay on disorder and order.* Berkeley, CA: California Press.

Bakan, D. (1966). *The duality of human existence.* Chicago: Rand McNally.

Bakeman, R., & Brown, J. (1980). Early interactions: Consequences for social and mental development at three years. *Child Development, 51,* 437–447.

Bakhtin, M. M. (1981). *The dialogical imagination: Four essays by M. M. Bakhtin* (M. Holquist, Ed., & C. Emerson & M. Holquist, Trans.). Austin: University of Texas Press.

Baldwin, J. M. (1906). *Thought and things: Vol. 1. A study of the development and meaning of thought.* New York: Macmillan.

Baldwin, J. M. (1908). *Thought and things: Vol. 2. A study of the development and meaning of thought.* New York: Macmillan.

Baldwin, J. M. (1911). *Thought and things: Vols. 3–4. A study of the development and meaning of thought.* New York: Macmillan.

Baltes, P. B., & Smith, J. (1990). Toward a psychology of wisdom and its ontogenesis. In R. J. Sternberg (Ed.), *Wisdom: Its nature, origins, and development* (pp. 87–120). New York: Cambridge University Press.

Bandura, A. (1977). *Social learning theory.* Englewood Cliffs, NJ: Prentice-Hall.

Barker, R. (1950). *Ecological psychology.* Stanford, CA: Stanford University Press.

Barron, F. (1969). *Creative person and creative process.* New York: Holt, Rinehart and Winston.

Basseches, M. A. (1980). Dialectical schemata: A framework for the empirical study of the development of dialectical thinking. *Human Development, 23,* 400–421.

Baumrind, D. (1987). A developmental perspective on adolescent risk taking behavior in contemporary America. In C. E. Irwin (Ed.), *Adolescent social behavior and health* (pp. 93–125). San Francisco: Jossey-Bass.

Baumrind, D. (1989). Rearing competent children. In W. Damon (Ed.), *Child development today and tomorrow* (pp. 349–378). San Francisco: Jossey-Bass.

Bee, H. (1992). *The journey of adulthood.* New York: Macmillan.

Bell, S. M., & Ainsworth, M. D. S. (1972). Infant crying and maternal responsiveness. *Child Development, 43,* 1171–1190.

Berlyne, D. E. (1960). *Conflict, arousal and curiosity.* New York: McGraw-Hill.

Berlyne, D. E. (1966). Curiosity and exploration. *Science, 153,* 25–33.

Block, J. H. (1982). Assimilation, accommodation, and the dynamics of personality development. *Child Development, 53,* 281–295.

Block, J. H., & Block, J. (1980). The role of ego-control and ego-resiliency in the organization of behavior. In W. A. Collins (Ed.), *Minnesota Symposia on Child Psychology: Vol. 13. Development of cognition, affect, and social relations* (pp. 39–101). Hillsdale, NJ: Erlbaum.

Bolk, L. (1926). *Das Problem der Menschwerdung.* Jena, Germany: Gustav Fischer.

Bowlby, J. (1969). *Attachment and loss: Vol. 1. Attachment.* New York: Basic Books.

Brazelton, T., Koslowski, B., & Main, M. (1974). The origins of reciprocity: The early mother-infant interaction. In M. Lewis & L. Rosenblum (Eds.), *The effect of the infant on its caregiver* (pp. 49–76). New York: Wiley.

Brent, S. B., & Watson, D. (1980, November). *Aging and wisdom: Individual and collective aspects.* Paper presented at the third annual meeting of the Gerontological Society, San Diego, CA.

Bretherton, I. (1987). New perspectives on attachment relations: Security, communication, and internal working models. In J. Osofsky (Ed.), *Handbook of infant development* (pp. 1061–1100). New York: Wiley.

Bronfenbrenner, U. (1992). Ecological systems theory. In R. Vasta (Ed.), *Six theories of child development* (pp. 187–249). London: Jessica Kingsley.

Broughton, J. M., & Freeman-Moir, D. J. (Eds.). (1982). *The cognitive developmental psychology of James Mark Baldwin: Current theory and research in genetic epistemology.* Norwood, NJ: Ablex.

Bruner, J. S. (1972). The nature and uses of immaturity. *American Psychologist, 27,* 687–708.

Bruner, J. S. (1986). Value presuppositions of developmental theory. In L. Cirillo & S. Wapner (Eds.), *Value presuppositions in theories of human development* (pp. 19–28). Hillsdale, NJ: Erlbaum.

Bruner, J. S. (1990). *Acts of meaning.* Cambridge, MA: Harvard University Press.

Bruner, J. S., Jolly, A., & Sylva, K. (Eds.). (1976). *Play: Its role in development and evolution.* New York: Penguin Books.

Cairns, R. B., & Hood, K. E. (1983). Continuity in social development: A comparative perspective on individual differences prediction. In P. B. Baltes & O. G. Brim (Eds.), *Life-span development and behavior* (Vol. 5, pp. 301–358). New York: Academic Press.

Carnegie Council on Adolescent Development. (1989). *Turning points: Preparing American youth for the 21st century.* New York: Carnegie Corporation.

Caron, R. F., & Caron, A. J. (1968). The effect of repeated exposure and stimulus complexity on visual fixation in infants. *Psychonomic Science, 10,* 207–208.

Chalmers, D. (1995). Facing up to the problem of consciousness. *Journal of Consciousness Studies, 2,* 200–219.

Chinen, A. B. (1984). Modal logic: A new paradigm of development and late-life potential. *Human Development, 27,* 42–56.

Clark, G. N., & Seifer, R. (1983). Facilitating mother-infant communication: A treatment model for high-risk and developmentally delayed infants. *Infant Mental Health Journal, 4,* 67–82.

Clayton, V. P., & Birren, J. E. (1980). The development of wisdom across the life span: A reexamination of an ancient topic. In P. B. Baltes & O. R. Brim (Eds.), *Life span development and behavior* (Vol. 3, pp. 103–135). New York: Academic Press.

Cohen, L. B., & Younger, B. A. (1983). Perceptual categorization in the infant. In E. Scholnick (Ed.), *New trends in conceptual representation* (pp. 197–220). Hillsdale, NJ: Erlbaum.

Cooley, C. H. (1902). *Human nature and the social order.* New York: Scribners.

Cooley, C. H. (1961). The social self. In T. Parsons, E. Shils, K. Naegele, & J. Pitts (Eds.), *Theories of society: Foundations of modern sociological theory* (pp. 822–828). New York: Free Press.

Cooper, C. R., Grotevant, H. D., & Condon, S. M. (1983). Individuality and connectedness in the family as a context for adolescent identity formation and role-taking skill. In H. D. Grotevant & C. R. Cooper (Eds.), *Adolescent development in the family* (pp. 43–59). San Francisco: Jossey-Bass.

Costa, P. T., & McCrae, R. R. (1980). Still stable after all these years: Personality as a key to some issues in adulthood and old age. In P. B. Baltes & J. O. G. Brim (Eds.), *Life-span development and behavior* (pp. 64–103). New York: Academic Press.

Craik, K. (1943). *The nature of explanation.* Cambridge, England: Cambridge University Press.

Csikszentmihalyi, M. (1975). *Beyond boredom and anxiety.* San Francisco: Jossey-Bass.

Csikszentmihalyi, M. (1990). *Flow.* New York: Harper & Row.

Csikszentmihalyi, M. (1993). *The evolving self.* New York: HarperCollins.

Csikszentmihalyi, M. (1996). *Creativity: Flow and the psychology of discovery and invention.* New York: HarperCollins.

Csikszentmihalyi, M., & Csikszentmihalyi, I. S. (Eds.). (1988). *Optimal experience: Psychological studies of flow in consciousness.* New York: Cambridge University Press.

Csikszentmihalyi, M., & Nakamura, J. (in press). Wisdom: Origins, outcomes and experiences. In R. J. Sternberg & J. Jordan (Eds.), *A handbook of wisdom: Psychological perspectives.* New York: Cambridge University Press.

Csikszentmihalyi, M., & Rathunde, K. (1990). The psychology of wisdom: An evolutionary interpretation. In R. J. Sternberg (Ed.), *Wisdom: Its nature, origins, and development* (pp. 25–51). New York: Cambridge University Press.

Csikszentmihalyi, M., & Rathunde, K. (1993). The measurement of flow in everyday life: Towards a theory of emergent motivation. In J. E. Jacobs (Ed.), *Nebraska Symposium on Motivation: Vol. 40. Developmental perspectives on motivation* (pp. 57–98). Lincoln: University of Nebraska Press.

Csikszentmihalyi, M., Rathunde, K., & Whalen, S. (1993). *Talented teenagers: The roots of success and failure.* New York: Cambridge University Press.

Csikszentmihalyi, M., & Schneider, B. (2000). *Becoming adult.* New York: Basic Books.

Damasio, A. (1994). *Decartes' error.* New York: Penguin.

Damon, W. (1983). *Social and personality development.* New York: Norton.

Dewey, J. (1913). *Interest and effort in education.* Cambridge, MA: Riverside.

Dewey, J. (1933). *How we think.* Boston: D. C. Heath & Company.

Dewey, J. (1938). *Experience and education.* New York: Macmillan.

Dewey, J. (1980). *Art as experience.* New York: Perigee. (Original work published 1934)

Eccles, J., Lord, S., & Midgley, C. (1991). What are we doing to early adolescents? The impact of educational contexts on early adolescents. *American Journal of Education, 99*(4), 521–542.

Eccles, J., Midgley, C., Wigfield, A., Buchanan, C. M., Reuman, D., Flanagan, C., et al. (1993). Development during adolescence: The impact of stage-environment fit on young adolescents' experience in schools and families. *American Psychologist, 48,* 90–101.

Ellis, M. J. (1973). *Why people play.* Englewood Cliffs, NJ: Prentice-Hall.

Erikson, E. H. (1950). *Childhood and society.* New York: Norton.

Erikson, E. H. (1977). *Toys and reasons.* New York: Norton.

Erikson, E. H., Erikson, J. M., & Kivnick, H. Q. (1986). *Vital involvement in old age: The experience of old age in our time.* New York: Norton.

Eysenck, H. J. (1973). *Eysenck on extroversion.* New York: Wiley.

Fagen, R. M. (1976). Modeling: How and why play works. In J. S. Bruner, A. Jolly, & K. Sylva (Eds.), *Play: Its role in development and evolution* (pp. 96–115). New York: Penguin Books.

Feldlaufer, H., Midgley, C., & Eccles, J. S. (1988). Student, teacher, and observer perceptions of the classroom behavior before and after the transition to junior high school. *Journal of Early Adolescence, 8,* 133–156.

Field, T. (1977). Effects of early separation, interactive deficits, and experimental manipulations on infant-mother face-to-face interaction. *Child Development, 48,* 763–771.

Field, T. (1984). Separation stress of young children transferring to new schools. *Developmental Psychology, 20,* 786–792.

Field, T. (1985). Attachment as psychobiological attunement: Being on the same wave length. In M. Reite & T. Field (Eds.), *Psychobiology of attachment* (pp. 415–454). Orlando, FL: Academic Press.

Field, T. (1987). Affective and interactive disturbances in infants. In J. Osofsky (Ed.), *Handbook of infant development* (pp. 972–1005). New York: Wiley.

Ford, D. H., & Lerner, R. M. (1992). *Developmental systems theory: An integrative approach.* Newbury Park, CA: Sage.

Fox, B. A. (1988a). *Cognitive and interactional aspects of correction in tutoring* (Tech. Rep. No. 88-2). Boulder: University of Colorado, Institute of Cognitive Science.

Fox, B. A. (1988b). *Interaction as a diagnostic resource in tutoring* (Tech. Rep. No. 88-3). Boulder: University of Colorado, Institute of Cognitive Science.

Fredrickson, B. L. (1998). What good are positive emotions? *Review of General Psychology, 2,* 300–319.

Freedman, D. G. (1979). *Human sociobiology.* New York: Free Press.

Freud, S. (1959). Creative writers and daydreaming. In J. S. Strackey (Ed.), *The standard edition of the complete psychological works of Sigmund Freud* (Vol. 9, pp. 141–153). London: Hogarth Press.

Gardner, H. (1993). *Creating minds.* New York: Basic Books.

Gardner, H. (1995). *Leading minds: An anatomy of leadership.* New York: Basic Books.

Gardner, H. (1998). Extraordinary Cognitive Achievements (ECA): A symbol systems approach. In W. Damon (Editor-in-Chief) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 415–466). New York: Wiley.

Getzels, J. (1975). Creativity: Prospects and issues. In I. Taylor & J. W. Getzels (Eds.), *Perspectives in creativity* (pp. 326–344). Chicago: Aldine.

Gilkey, L. (1990). *Gilkey on Tillich.* New York: Crossroad.

Gilligan, C. (1982). *In a different voice: Women's conception of self and of morality.* Cambridge, MA: Harvard University Press.

Gilligan, C., Lyons, N. P., & Hanmer, T. J. (Eds.). (1990). *Making connections.* Cambridge, MA: Harvard University Press.

Giorgi, A. (Ed.). (1985). *Phenomenology and psychological research.* Pittsburgh, PA: Duquesne University Press.

Gottesman, I. I. (1963). Genetic aspects of intelligent behavior. In N. R. Ellis (Ed.), *Handbook of mental deficiency: Psychological theory and research* (pp. 253–296). New York: McGraw-Hill.

Gottfried, A. E. (1985). Academic intrinsic motivation in elementary and junior high school students. *Journal of Educational Psychology, 77,* 631–645.

Gould, S. (1977). *Ontogeny and phylogeny.* Cambridge, MA: Harvard University Press.

Groos, K. (1901). *The play of man.* New York: Appleton.

Guilford, J. P. (1967). *The nature of human intelligence.* New York: McGraw-Hill.

Hadamard, T. (1954). *The psychology of invention in the mathematical field.* Princeton, NJ: Princeton University Press.

Hardy-Brown, K., Plomin, R., & DeFries, J. C. (1981). Genetic and environmental influences on the rate of communicative development in the first year of life. *Developmental Psychology, 17,* 704–717.

Hart, L. M. (1992, December). *Ritual art and the production of Hindu selves.* Paper presented at the meetings of the American Anthropological Association, San Francisco, CA.

Hauser, S. (1991). *Adolescents and their families.* New York: Free Press.

Havighurst, R. J. (1953). *Human development and education.* New York: Longmans, Green.

Hebb, D. O. (1955). Drive and the CNS (Conceptual Nervous System). *Psychological Review, 62,* 243–254.

Heber, M. (1981). Instruction versus conversation as opportunities for learning. In W. P. Robinson (Ed.), *Communications in development* (pp. 183–202). London: Academic Press.

Hektner, J., & Schmidt, J. (in press). *Measuring the quality of everyday life: The ESM handbook.* Newbury Park, CA: Sage.

Henderson, B. B. (1984a). Parents and exploration: The effect of context on individual differences in exploratory behavior. *Child Development, 55,* 1237–1245.

Henderson, B. B. (1984b). Social support and exploration. *Child Development, 55,* 1246–1251.

Holliday, S. G., & Chandler, M. J. (1986). *Wisdom: Explorations in adult competence.* Basel, Switzerland: Krager.

Huizinga, J. (1955). *Homo ludens.* Boston: Beacon Press.

Husserl, E. (1960). *Cartesian meditations: An introduction to phenomenology* (D. Cairns, Trans.). Den Haag, The Netherlands: Martinus Nijhoff.

Huxley, J. S. (1942). *Evolution: The modern synthesis.* New York: Harper and Brothers.

Inghilleri, P. (1999). *From subjective experience to cultural change.* Cambridge, England: Cambridge University Press.

Irwin, C. E. (Ed.). (1987). *Adolescent social behavior and health.* San Francisco: Jossey-Bass.

Isabella, R. A., & Belsky, J. (1991). Interactional synchrony and the origins of infant-mother attachment: A replication study. *Child Development, 62,* 373–384.

Izard, C. E. (1977). *Human emotions.* New York: Plenum Press.

James, W. (1890). *Principles of psychology.* New York: Henry.

James, W. (1902). *The varieties of religious experience: A study in human nature.* New York: Longmans, Green.

James, W. (1904). A world of pure experience. *Journal of Phiolosophy, Psychology and Scientific Methods, 1,* 533–543.

James, W. (1917). *Selected papers on philosophy.* London: J. M. Dent & Sons.

Johanson, D. C., & Edey, M. A. (1981). *Lucy: The beginnings of humankind.* New York: Simon & Schuster.

Johnson, M. (1987). *The body in the mind.* Chicago: University of Chicago Press.

Johnson-Laird, P. N. (1983). *Mental models.* Cambridge, MA: Harvard University Press.

Jung, C. G. (1946). *Psychological types.* New York: Harcourt Brace.

Kahlbaugh, P. (1993). James Mark Baldwin: A bridge between social and cognitive theories of development. *Journal for the Theory of Social Behavior, 23,* 79–103.

Kakar, S. (1978). *The inner world: A psychoanalytic study of childhood and society in India.* New Delhi, India: Oxford University Press.

Kegan, R. (1982). *The evolving self.* Cambridge, MA: Harvard University Press.

Kelly, G. A. (1955). *The psychology of personal constructs.* New York: Norton.

Kestenbaum, V. (1977). *The phenomenological sense of John Dewey.* Atlantic Highlands, NJ: Humanities Press.

Kojima, H. (1986). Child rearing concepts as a belief-value system of the society and the individual. In H. Stevenson, H. Azuma, & K. Hakuta (Eds.), *Child development and education in Japan* (pp. 39–54). New York: Freeman.

Kolb, D. A. (1984). *Experiential Learning.* Englewood Cliffs, NJ: Prentice-Hall.

Kouzes, J. M., & Posner, B. Z. (1995). *The leadership challenge.* San Francisco: Jossey-Bass.

Kramer, D. A. (1983). Post-formal operations? A need for further conceptualization. *Human Development, 26,* 91–105.

Kris, E. (1952). *Psychoanalytic explorations in art.* New York: International Universities Press.

Kuhn, D. (1978). Mechanisms of cognitive and social development: One psychology or two? *Human Development, 21,* 92–118.

Kuo, Y. (1976). Chinese dialectical thought and character. In J. F. Rychlak (Ed.), *Dialectic: Humanistic rationale for behavior and development* (pp. 72–86). Basel, Switzerland: Karger.

Labouvie-Vief, G. (1980). Beyond formal operations: Uses and limits of pure logic in life span development. *Human Development, 23,* 141–161.

Labouvie-Vief, G. (1982). Dynamic development and mature autonomy. *Human Development, 25,* 161–191.

Labouvie-Vief, G. (1990). Wisdom as integrated thought: Historical and developmental perspectives. In R. J. Sternberg (Ed.), *Wisdom: Its nature, origins, and development* (pp. 52–83). New York: Cambridge University Press.

Labouvie-Vief, G. (1994). *Psyche and eros.* New York: Cambridge University Press.

Lakoff, G., & Johnson, M. (1999). *Philosophy in the flesh.* New York: Basic Books.

Lamb, M. (Ed.). (1982). *Nontraditional families: Parenting and child development.* Hillsdale, NJ: Erlbaum.

Larson, R., & Richards, M. H. (1994). *Divergent realities: The emotional lives of mothers, fathers, and adolescents.* New York: Basic Books.

Leavitt, H. J., Pondy, L. R., & Boje, D. M. (1989). *Readings in managerial psychology* (4th ed.). Chicago: University of Chicago Press.

Lerner, R. M. (1984). *On the nature of human plasticity.* New York: Cambridge University Press.

Lerner, R. M. (2002). *Concepts and theories of human development* (3rd ed.). Mahwah, NJ: Erlbaum.

Lerner, R. M., & Busch-Rossnagel, N. A. (Eds.). (1981). *Individuals as producers of their development: A life-span perspective.* New York: Academic Press.

Lerner, R. M., & Lerner, J. (1987). Children in their contexts: A goodness-of-fit model. In J. Lancaster, J. Altmann, A. Rossi, & L. Sherrod (Eds.), *Parenting across the life span* (pp. 377–404). New York: Aldine de Gruyter.

LeVine, R. (1980). Adulthood among the Gusii. In N. Smelser & E. Erikson (Eds.), *Themes of work and love in adulthood* (pp. 77–104). Cambridge, MA: Harvard University Press.

Levinson, D. J. (1980). Toward a conception of the adult life course. In N. Smelser & E. Erikson (Eds.), *Themes of work and love in adulthood* (pp. 265–290). Cambridge, MA: Harvard University Press.

Lévi-Strauss, C. (1967). *Tristes tropiques.* New York: Atheneum.

Lewis, M., & Rosenblum, L. A. (Eds.). (1974). *The effect of the infant on its caregiver.* New York: Wiley.

Lewontin, R. C. (1981). On constraints and adaptation. *Behavioral and Brain Sciences, 4,* 244–245.

Loevinger, J. (1966). The meaning and measurement of ego development. *American Psychologist, 21,* 195–206.

Lorenz, K. (1971). *Studies in animal and human behavior* (Vol. 2). Cambridge, MA: Harvard University Press.

Maccoby, E. E., & Martin, J. A. (1983). Socialization in the context of the family: Parent-child interaction. In P. H. Mussen (Series Ed.) & E. M. Hetherington (Vol. Ed.), *Handbook of child psychology: Vol. 4. Socialization, personality, and social development* (pp. 1–101). New York: Wiley.

MacIntyre, A. (1984). *After virtue: A study in moral theory.* Notre Dame, IN: University of Notre Dame Press.

Marcia, J. E. (1966). Development and validation of ego identity status. *Journal of Personality and Social Psychology, 3,* 551–558.

Marriott, M. (1976). Hindu transactions: Diversity without dualism. In B. Kepferer (Ed.), *Transaction and meaning: Directions in the anthropology of exchange and symbolic behavior* (pp. 109–142). Philadelphia: Institute for the Study of Human Issues.

Martini, M. (1994). Peer interaction in Polynesia: A view from the Marquesas. In J. L. Roopnarine, J. E. Johnson, & F. H. Hooper (Eds.), *Children's play in diverse cultures* (pp. 73–103). Albany: State University of New York Press.

Martini, M., & Kirkpatrick, J. (1992). Parenting in Polynesia: A view from the Marquesas. In J. L. Roopnarine & D. B. Carter (Eds.), *Annual advances in applied developmental psychology* (Vol. 5, pp. 199–222). Norwood, NJ: Ablex.

Maslow, A. (1968). *Toward a psychology of being.* New York: Van Nostrand Reinhold.

Maslow, A. (1971). *The farther reaches of human nature.* New York: Penguin Books.

Massimini, F., & Delle Fave, A. D. (2000). Individual development in a bio-cultural perspective. *American Psychologist, 55,* 24–33.

Matas, L., Arend, R. A., & Sroufe, L. A. (1978). Continuity and adaption in the second year: The relationship between quality of attachment and later competence. *Child Development, 49,* 547–556.

McCrae, R. R., & Costa, P. T., Jr. (1984). *Emerging lives, enduring dispositions: Personality in adulthood.* Boston: Little, Brown.

Meacham, J. A. (1983). Wisdom and the context of knowledge: Knowing that one doesn't know. In D. Kuhn & J. A. Meacham (Eds.), *On the development of developmental psychology* (pp. 111–134). Basel, Switzerland: Karger.

Mead, G. H. (1934). *Mind, self, and society.* Chicago: University of Chicago Press.

Merleau-Ponty, M. (1962). *Phenomenology of perception* (C. Smith, Trans.). New York: Humanities Press.

Mischel, W. (1968). *Personality and assessment.* New York: Wiley.

Montagu, A. (1989). *Growing young.* Boston: Bergin & Garvey.

Montessori, M. (1946). *Unpublished lectures.* London: AMI.

Montessori, M. (1976). *From childhood to adolescence* (2nd ed.). New York: Schocken.

Montessori, M. (1989). *To educate the human potential.* Oxford, England: Clio Press Ltd.

Nakamura, J., & Csikszentmihalyi, M. (2002). The concept of flow. In C. R. Synder & S. J. Lopez (Eds.), *Handbook of positive psychology* (pp. 89–105). London: Oxford University Press.

Nakamura, J., & Csikszentmihalyi, M. (2003). The construction of meaning through vital engagement. In C. L. Keyes & J. Haidt (Eds.), *Flourishing: Positive psychology and the life well-lived* (pp. 83–104). Washington, DC: American Psychological Association.

Nietzsche, F. (1968). *The portable Nietzsche* (W. Kaufmann, Trans.). New York: Viking.

Nietzsche, F. (1974). *The gay science* (W. Kaufmann, Trans.). New York: Vintage Books.

Ochs, E., & Schieffelin, B. B. (1984). Language acquisition and socialization: Three developmental stories and their implications. In R. Shweder & R. LeVine (Eds.), *Culture and its acquisition* (pp. 276–311). Chicago: University of Chicago Press.

Olson, S. L., Bates, J. E., & Bayles, K. (1984). Mother-infant intraction and the development of individual differences in children's cognitive competence. *Developmental Psychology, 20,* 166–179.

Pandey, R. B. (1969). *Hindu samskaras: A sociological study of the Hindu.* New Delhi, India: Motilal.

Papousek, H., & Papousek, M. (1987). Intuitive parenting: A dialectic counterpart to the infant's integrative competence. In J. Osofsky (Ed.), *Handbook of infant development* (pp. 669–720). New York: Wiley.

Parsons, T., & Bales, R. F. (1955). *Family, socialization and interaction process.* Glencoe, IL: Free Press.

Pascual-Leone, J. (1990). Wisdom: Toward organismic processes. In R. J. Sternberg (Ed.), *Wisdom: Its nature, origins, and development* (pp. 244–278). New York: Cambridge University Press.

Pearlin, L. I. (1982). Discontinuities in the study of aging. In T. K. Hareven & K. J. Adams (Ed.), *Aging and life course perspectives: An interdisciplinary perspective* (pp. 55–74). New York: Guilford Press.

Piaget, J. (1952). Autobiography. In E. G. Boring (Ed.), *A history of psychology in autobiography* (Vol. 4, pp. 237–256). Worcester, MA: Clark University Press.

Piaget, J. (1962). *Play, dreams, and imitation in childhood.* New York: Norton.

Piaget, J. (1966). Response to Brian Sutton-Smith. *Psychological Review, 73,* 111–112.

Prigogine, I. (1980). *From being to becoming: Time and complexity in the physical sciences.* San Francisco: Freeman.

Rathunde, K. (1993). The experience of interest: A theoretical and empirical look at its role in adolescent talent development. In P. Pintrich & M. Maehr (Eds.), *Advances in motivation and achievement* (Vol. 8, pp. 59–98). Greenwich, CT: JAI Press.

Rathunde, K. (1995). Wisdom and abiding interest: Interviews with three noted historians in later-life. *Journal of Adult Development, 2,* 159–172.

Rathunde, K. (1996). Family context and talented adolescents' optimal experience in productive activities. *Journal of Research on Adolescence, 6,* 603–626.

Rathunde, K. (1997). Parent-adolescent interaction and interest. *Journal of Youth and Adolescence, 26,* 669–689.

Rathunde, K. (2001a). Family context and the development of undivided interest: A longitudinal study of family support and challenge and adolescents' quality of experience. *Applied Developmental Science, 5,* 158–171.

Rathunde, K. (2001b). Montessori education and optimal experience: A framework for new research. *NAMTA, 26,* 11–43.

Rathunde, K. (2001c). Toward a psychology of optimal human functioning: What positive psychology can learn from the "experiential turns" of James, Dewey, and Maslow. *Journal of Humanistic Psychology, 41,* 135–153.

Rathunde, K., & Csikszentmihalyi, M. (1993). Undivided interest and the growth of talent: A longitudinal study of adolescents. *Journal of Youth and Adolescence, 22,* 1–21.

Rathunde, K., & Csikszentmihalyi, M. (2005a). Middle school students' motivation and quality of experience: A comparison of Montessori and traditional school environments. *American Journal of Education, 111,* 341–371.

Rathunde, K., & Csikszentmihalyi, M. (2005b). The social context of middle school: Teachers, friends, and activities in Montessori and traditional school environments. *The Elementary School Journal, 106,* 59–79.

Riegel, K. F. (1973). Dialectical operations: The final period of cognitive development. *Human Development, 16,* 346–370.

Rogers, C. (1959). A theory of therapy, personality, and interpersonal relationships as developed in the client-centered framework. In S. Koch (Ed.), *Psychology: A study of a science: Vol. III. Formulations of the person and the social context* (pp. 184–256). New York: McGraw-Hill.

Rogers, C. (1969). *Freedom to learn.* Columbus, OH: Merrill.

Rogoff, B. (1990). *Apprenticeship in thinking: Cognitive development in social context.* New York: Oxford University Press.

Rogoff, B., & Gardner, W. P. (1984). Adult guidance of cognitive development. In B. Rogoff & J. Lave (Eds.), *Everyday cognition: Its development in social context* (pp. 95–116). Cambridge, MA: Harvard University Press.

Rogoff, B., Mistry, J., Göncü, A., & Mosier, C. (1993). Guided participation in cultural activity by toddlers and caregivers. *Monographs of the Society for Research in Child Development, 58*(Serial No. 236).

Rubin, K. H., Fein, G. G., & Vandenberg, B. (1983). Play. In P. H. Mussen (Series Ed.) & E. M. Hetherington (Vol. Ed.), *Handbook of child psychology: Vol. 4. Socialization, personality, and social development* (pp. 693–773). New York: Wiley.

Runco, M. A. (1991). *Divergent thinking.* Norwood, NJ: Ablex.

Rychlak, J. F. (Ed.). (1976). *Dialectic: Humanistic rationale for behavior and development.* Basel, Switzerland: Karger.

Schneider, W., & Shiffrin, R. M. (1977). Controlled and automatic human information processing: Pt. 1. Detection, search, and attention. *Psychological Review, 84,* 1–66.

Schneirla, T. C. (1959). An evolutionary and developmental theory of biphasic processes underlying approach and withdrawal. In M. R. Jones (Ed.), *Nebraska Symposium on Motivation* (Vol. 7, pp, 1–41). Lincoln: University of Nebraska Press.

Schneirla, T. C. (1965). Aspects of stimulation and organization in approach/withdrawl processes underlying vertebrate behavioral development. In D. S. Lehrman, R. A. Hinde, & E. Shaw (Eds.), *Advances in the study of behavior* (Vol. 1, pp. 1–71). New York: Academic Press.

Seligman, M. E. P., & Csikszentmihalyi, M. (2000). Positive psycholgy: An introduction. *American Psychologist, 55*(1), 5–14.

Semel, S., & Sadovnik, A. (1998). *Schools of tommorow, schools of today: What happened to progressive education* (Vol. 8). New York: Peter Lang.

Sigman, M., Cohen, S. E., & Forsythe, A. B. (1981). The relation of early infant measures to later development. In S. L. Friedman & M. Sigman (Eds.), *Preterm birth and psychological development* (pp. 313–327). New York: Academic Press.

Simonton, D. K. (1984). *Genius, creativity, and leadership.* Cambridge, MA: Harvard University Press.

Sinnott, J. (1984). Postformal reasoning: The relativistic stage. In M. L. Commons, F. A. Richards, & C. Armons (Eds.), *Beyond formal operations* (pp. 298–325). New York: Praeger.

Spence, J. T., & Helmreich, R. L. (1978). *Masculinity and femininity: Their psychological dimensions, correlates, and antecedents.* Austin: University of Texas Press.

Sroufe, L. A. (1979). The coherence of individual development. *American Psychologist, 34,* 834–841.

Standing, E. M. (1984). *Maria Montessori: Her life and work.* New York: Penguin Books.

Stern, D. M. (1974). Mother and infant at play: The dyadic interaction involving facial, vocal, and gaze behaviors. In M. Lewis & L. Rosenblum (Eds.), *The effect of the infant on its caregiver* (pp. 187–213). New York: Wiley.

Stern, D. M. (1985). *The interpersonal world of the infant.* New York: Basic Books.

Sternberg, R. J. (Ed.). (1984). *Mechanisms of cognitive development.* New York: Freeman.

Sternberg, R. J. (1990). Wisdom and its relations to intelligence and creativity. In R. J. Sternberg (Ed.), *Wisdom: Its nature, origins, and development* (pp. 142–159). New York: Cambridge University Press.

Sternberg, R. J. (2001). Why schools should teach for wisdom: The balance theory of wisdom in educational settings. *Educational Psychologist, 36,* 227–245.

Sutton-Smith, B. (1976). Current research and theory on play, games and sports. In T. Craig (Ed.), *The humanistic and mental health aspects of sports, exercise and recreation* (pp. 1–5). Chicago: American Medical Association.

Taylor, E., & Wozniak, R. (1996). *Pure experience: The response to William James.* Bristol, England: Thoemmes Press.

Thomas, A., & Chess, S. (1977). *Temperament and development.* New York: Brunner/Mazel.

Thomas, W. I., & Znaniecki, F. (1927). *The Polish peasant in Europe and America.* New York: Knopf.

Tobach, E. (1981). Evolutionary aspects of the activity of the organism and its development. In R. M. Lerner & N. A. Busch-Rossnagel (Eds.), *Individuals as producers of their development: A life-span perspective* (pp. 37–68). New York: Academic Press.

Tobach, E., & Schneirla, T. C. (1968). The biopsychology of social behavior of animals. In R. E. Cooke & S. Levin (Eds.), *Biologic basis of pediatric practice* (pp. 60–82). New York: McGraw-Hill.

Toynbee, A. (1987). *A study of history.* New York: Oxford University Press.

Trevarthen, C. (1979). Communication and cooperation in infancy: A description of primary intersubjectivity. In M. Bullowa (Ed.), *Before speech: The beginnings of human communication* (pp. 321–347). Cambridge, England: Cambridge University Press.

Trevarthen, C. (1988). Universal co-operative motives: How infants begin to know the language and culture of their parents. In G. Jahoda & I. M. Lewis (Eds.), *Acquiring culture: Cross-cultural studies in child development* (pp. 37–90). London: Croom Helm.

Tucker, D. M., & Williamson, P. A. (1984). Asymmetric neural control systems in human self-regulation. *Psychological Review, 91,* 185–215.

Turkewitz, G., Gardner, J., & Lewkowicz, D. J. (1984). Sensory/perceptual functioning during early infancy: The implications of a quantitative basis for responding. In G. Greenberg & E. Tobach (Eds.), *Behavioral evolution and integrative levels* (pp. 167–195). Hillsdale, NJ: Erlbaum.

Vaillant, G. (1993). *The wisdom of the ego.* Cambridge, MA: Harvard University Press.

Vandenberg, B. (1981). Play: Dormant issues and new perspectives. *Human Development, 24,* 357–365.

Varela, F., Thompson, E., & Rosch, E. (1991). *The embodied mind: Cognitive science and human experience.* Cambridge, MA: MIT Press.

Vygotsky, L. (1962). *Thought and language.* New York: Wiley.

Vygotsky, L. (1978). *Mind in society: The development of higher psychological processes.* Cambridge, MA: Harvard University Press.

Waldrop, M. (1992). *Complexity: The emerging science at the edge of order and chaos.* New York: Simon & Schuster.

Ward, M. C. (1971). *Them children: A study of language learning.* New York: Holt, Rinehart and Winston.

Wells, A. (1988). Self-esteem and optimal experience. In M. Csikszentmihalyi & I. S. Csikszentmihalyi (Eds.), *Optimal experience: Psychological studies of flow in consciousness* (pp. 327–341). New York: Cambridge University Press.

Wentzel, K. (1998). Social relationships and motivation in middle school: The role of parents, teachers, and peers. *Journal of Educational Psychology, 90,* 202–209.

Wertsch, J. V. (1979). From social interaction to higher psychological functions. *Human Development, 22,* 1–22.

Wertsch, J. V. (1985). *Vygotsky and the social formation of mind.* Cambridge, MA: Harvard University Press.

Wertsch, J. V. (1991). A sociocultural approach to mind. In W. Damon (Ed.), *Child development today and tomorrow* (pp. 14–33). San Francisco: Jossey-Bass.

Wood, D. J., & Middleton, D. (1975). A study of assisted problem-solving. *British Journal of Psychology, 66,* 181–191.

CHAPTER 10

Action Perspectives on Human Development

JOCHEN BRANDTSTÄDTER

THE RISE OF ACTION PERSPECTIVES IN DEVELOPMENTAL PSYCHOLOGY 516
Cultural Regulation of Development 518
Personal Regulation of Developmental Processes 519
Historical Notes 520
THE CONCEPT OF ACTION 521
Structural Theories of Action 521
Motivational Theories of Action 522
Control-System Theories of Action 522
Social-Constructivist Concepts of Action: Activity Theory 522
Explicating Action: Conceptual Constituents 522
Constraints of Action: Constitutive and Regulative Rules 524
The Polyvalence of Actions 524
The Context of Action 526
DEVELOPMENTAL DIVERSITY AND REGULARITY: ACTION-THEORETICAL RECONSTRUCTIONS 527
The Construction and Deconstruction of Developmental Coherence 528
Developmental Plasticity: Weak and Strong Constraints 529
Invariance and Universality in Development: An Action-Theoretical Account 530
INTENTIONAL SELF-DEVELOPMENT AND PERSONAL CONTROL OVER DEVELOPMENT 535
Activities of Intentional Self-Development: Structure and Process 535
Self-Observation and Self-Monitoring in Intentional Self-Development 536
Processes of Self-Evaluation 538
From Goals to Action: Definition and Implementation of Developmental Goals 540
PERSONAL CONTROL OVER DEVELOPMENT: EMERGENCE AND DEVELOPMENTAL CHANGE 544
Intentional Action: Developmental Aspects 545
Development of Control-Related Beliefs and Motivations 546
Intentional Self-Development and the Developing Self 548
Preserving Personal Continuity and Identity: Assimilative and Accommodative Processes 551
SUMMARY AND CONCLUSIONS 555
REFERENCES 556

THE RISE OF ACTION PERSPECTIVES IN DEVELOPMENTAL PSYCHOLOGY

Developmental psychology has elucidated the conditions and constraints of human ontogeny from a diversity of theoretical perspectives. However, it has not paid a great deal of attention to the individual's contribution to the creation of his or her own developmental history throughout the life span, although action perspectives are gaining momentum in developmental research and theorizing. Through action, and through experiencing the consequences of our actions, we construe representations of ourselves and of our material, social, and symbolic environments, and these representations guide and motivate activities, which shape and influence our behavior and personal development.

Action thus forms development, and development forms action: The individual is both the active producer and the product of his or her ontogeny. The central tenet of an action-theoretical perspective thus holds that human ontogeny, including adulthood and later life, cannot be understood adequately without paying heed to the self-reflective and self-regulative loops that link developmental changes to the ways in which individuals, by action and mentation, construe their personal development. This should not imply that individuals are the sole or omnipotent producer of their biography. Just like any

I am grateful to Richard M. Lerner, who provided thoughtful editorial comments on the entire manuscript, and to Werner Greve, who gave valuable comments on an earlier draft.

other type of activity, activities related to personal development are subject to cultural, sociohistorical, and physical constraints that lie partly or even completely outside one's span of control but decisively structure the range of behavioral and developmental options. Action-theoretical perspectives on development must therefore consider not only the activities through which individuals try to control their development over the life course, but also the nonpersonal or subpersonal forces that canalize such activities.

The idea that human individuals play an active part in shaping their development and aging has never been doubted seriously. Yet, at least until recently, no systematic effort has been made to frame this idea in an elaborated theoretical statement. Though actions have been recognized as formative elements of every individual life history, they have hardly figured as elements in developmental theories (Dannefer, 1989). Presumably, one reason for this neglect lies in the traditional preoccupation of developmental research with the formative periods from early childhood to adolescence. Activities of self-regulation and intentional self-development are related to personal goals, plans, and identity projects; such orientations typically become more differentiated and concrete in the transition to adulthood when developmental tasks of independence and autonomy gain importance. It is certainly no mere coincidence that early proponents of action-theoretical perspectives were simultaneously advocates of a life-span perspective in development; Charlotte Bühler (1933) is a prominent example. The neglect of action-theoretical perspectives may also reflect deeper epistemological and methodological reservations. The applicability of causal explanatory schemes to actions is a long-standing and still strongly contested controversy in philosophy of science, and a final consensus is not in sight (e.g., Brand, 1984; Lenk, 1978; Thalberg, 1977). Moreover, an action perspective that conceives of development as a process that is shaped and canalized by collective and personal action appears to be barely compatible with the search for deterministic laws and universal principles of development. These questions are discussed at more length later. It should be noted at this juncture, however, that notions of universality, ordered change, and determinism in human development have recently come under attack from various lines (e.g., Bruner, 1990a; Gergen, 1980). In the same measure, interest in action-theoretical perspectives has grown during the past decades (e.g., Brandtstädter, 1984a, 1984b, 2001; Brandtstädter & Lerner, 1999; Bruner, 1990b; Chapman, 1984; Crockett, 2002; Dannefer, 1984; Eckensberger & Meacham, 1984; J. Heckhausen, 1999; J. Heckhausen & Dweck, 1998; Lerner, 2002; Lerner & Busch-Rossnagel, 1981; Silbereisen, Eyferth, & Rudinger, 1987; Valsiner, 1989).

The actional stance seems to offer a vantage point for integrating developmental and cultural perspectives. In fact, the concepts of development, culture, and action are intrinsically related as illustrated by Figure 10.1. Development, as the result of personal and collective activity, is essentially a cultural product—this is the core of the argument advanced in the present chapter. Conversely, actions, and self-regulatory activities are dependent on developmental change; the goals, values, and beliefs that motivate and direct such activities change under the joint influence of ontogenetic and cultural-historical factors. Similar conceptual and functional links also relate the domains of action and culture. Cultures are the collective result of individual actions and decisions, even though the long-term and cumulative dynamics of cultural evolution and change generally are beyond the grasp of any single individual (Hayek, 1979). On the other hand, cultures form action-spaces (Boesch, 1980, 1991) that shape possibilities, outcomes, and meanings of actions, and cultural institutions constitute certain types of action, as I explain later. The mentioned relationships also imply a functional interdependence between culture and human ontogeny, which is mediated through constructive and selective action: Individuals shape their developmental ecology and thus regulate their own development; they construct a personal culture (Heidmets, 1985) that becomes a constitutive element of the larger cultural

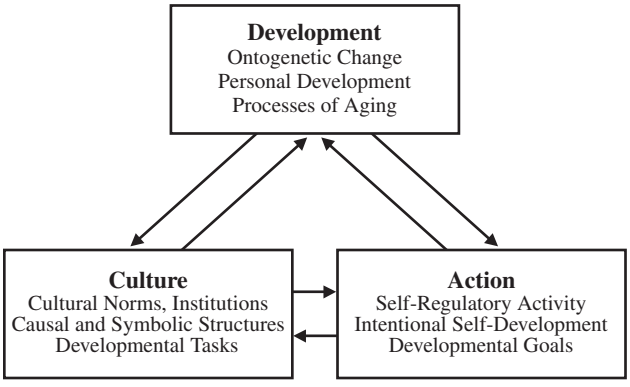


Figure 10.1 Development, culture, and action as interrelated spheres.

macrosystem. The cultural context, in turn, forms an arrangement of constraints and "affordances"—to use Gibson's (1977) terms—that canalizes and institutionalizes developmental pathways. This canalization is an essential requirement for the maintenance and self-perpetuation of the cultural system; conversely, human ontogeny in its physical, social, and psychological aspects is fundamentally dependent on the regulative and protective influences of the cultural context.

In the following sections, I focus on the multiple ways in which personal and collective actions, embedded in cultural and historical contexts, form, and are formed by, development over the life span.

Cultural Regulation of Development

The regulation and control of ontogenetic and age-graded change is integral to the processes by which cultures stabilize, reproduce, and reform themselves (e.g., Bourdieu & Passeron, 1977). Every cultural system has at its disposal a broad armamentarium of techniques, institutions, or rules to regulate development, and without such cultural proxies and scaffolds, human development would be virtually impossible. Neonates and young children vitally depend on persons who care for their physical and psychological development and who organize environmental contingencies in ways that enhance growth and fend off harmful influences. The regulation and institutionalization of development becomes increasingly salient in processes of education and socialization that define an arrangement of developmental tasks, affordances, and options across the life cycle. Like development itself, the canalization and control of development is a lifelong process. This process serves to transfer cultural values and problem solutions, and to inculcate attitudes, dispositions, and skills that are, or are considered to be, necessary for existence and coexistence in a cultural-historical context. The ontogenetic necessity of culture, however, is rooted more deeply in the biological constitution and the phylogenetic evolution of *Homo sapiens* (e.g., Tobach, 1981).

Among the evolutionary and biological predicaments that make possible, and at the same time enforce, the cultural contextualization of ontogeny is the great plasticity and openness of development. These features are already implied in the notion of culture, insofar as it connotes the cultivation and perfection of some object or process that is amenable to modification, particularly of life itself. As early as 1777, Johann Nicolas Tetens considered the "perfectibility" of human development as being premised on two basic conditions: the capability for reflexion and self-referential action (*innere Selbsttätigkeit*) and the modifiability of development:

> Among all fellow animate creatures, the human being is by far the most perfectible, the one that, at birth, has the largest potential for development . . .; the human being is the most flexible and versatile of all creatures, the one that can be modified with the greatest diversity, in accordance with the wide sphere of activity for which it is destined. (Tetens, 1777, p. 40; trans. J. B.)

The functional relationship between culture and ontogeny is captured even more cogently in the argument that cultural institutions—and the developmental and action potentials necessary for creating culture—compensate for the lack of specialized adaptive automatisms in the human organism. This idea can be traced back to the writings of Herder (1772); it has been taken up and elaborated in the anthropological system of Gehlen (1955/1988). As Gehlen pointedly puts it, the human individual is a "deficient being," who is characterized by a lack of physical specialization and of ties to a specific environment, and for whom culture has thus become a "second nature":

> Man is an acting being. In a narrower sense, he is also "undetermined"—he presents a challenge to himself. Actions are the expression of man's need to develop an attitude toward the outside world. To the extent that he presents a problem to himself, he must also develop an attitude toward himself and make something of himself . . . self-discipline, training, self-correction in order to achieve a certain state of being and maintain it are necessary to the survival of an "undetermined" being. (Gehlen, 1955/1988, pp. 24–25)

According to this stance, culture secures survival and development by providing an artificial arrangement of "outside-the-skin," compensatory means of adaptation (see also Geertz, 1973). The notion of humans as deficient beings, however, may be misleading as far as it equates lack of specialization with adaptive deficit. In fact, the lack of adaptive automatisms and instinctual regulations is more than offset by the remarkable ability of human agents to cope with adversity through creative and constructive action. To respond flexibly to the continuous and fluctuating adaptive challenges posed by a nonstationary environment, behavior must be organized

with sufficient latitude for variation and experience-based modification. The excessive growth of the cortical and neocortical areas of the central nervous system lends the requisite openness and variability to the cognitive and motivational control of behavior. Of particular mention here are capacities of abstraction, categorization, and representation, which enhance extraction of order and regularity from the flow of events and allow for a mental simulation of actions and effects. Human adaptive competencies are further boosted by language and communication. Language enables the transmission of knowledge, and provides the symbolic means for the social control of behavior, as well as for self-control and self-reinforcement (e.g., Luria, 1979; Zivin, 1979). The markedly prolonged period of physiological maturation and growth, the correspondingly long period of protection and care, and the emergence of family and group structures form a complex of mutually supportive evolutionary factors that make for both the vulnerability and the potential of human development (cf. Bruner, 1972; Gould, 1977; Lerner, 1984).

Culture and development thus form a functional synthesis that can be assessed adequately only when the mediating role of actions and self-related activities is considered. Cultures are aggregated systems of problem-solutions that have been developed during the process of cultural evolution; they offer solutions to adaptive problems that arise from the biological constitution of the human species, as well as to problems related to the maintenance and further evolution of the cultural system itself, and they also offer existential orientations that guide human actors in their search for meaning and purpose. Most important, cultures augment action resources and developmental options through compensatory strategies and "prosthetic devices" (Bruner, 1990b), thus enabling the developing subject to transcend constitutional limitations. These compensatory arrangements also comprise "psychological tools" (Vygotsky, 1960/1979), which are embodied in cultural conventions, institutions, and knowledge systems:

> Psychological tools are artificial formations. By their nature they are social, not organic or individual. They are directed toward the mastery or control of behavioral processes. . . . By being included in the process of behavior, the psychological tool alters the entire flow and structure of mental functions . . . just as a technical tool alters the process of a natural adaptation. (Vygotsky, 1960/1979, p. 137)

The commonplace formula which defines development as the joint or interactive product of genetic and environmental influences gives short shrift to the dynamic relationships that mediate development, action, and culture. Environment is "nature organized by organisms" (Lewontin, 1982, p. 160); likewise, developmental ecologies are "intentional worlds" (Shweder, 1990) that constrain and enable intentional self-development.

The semantic and symbolic content that essentially characterizes actions and cultural action spaces cannot be reduced to physical or physiological processes. Although the meaning of actions may be related to, and can partly be extracted from, the physical features of actions, intentional and physical aspects of action are not related in ways that would allow for reductive explanations (Dennett, 1987). This does not mean that an actional stance would necessitate discarding the "natural" bases and constraints of action. Natural and cultural aspects influence and pervade each other in the developmental process (Boesch, 1980; Brandtstädter, 1984a, 1984b; Dannefer & Perlmutter, 1990; Gibson, 1977), and I have already pointed to the interdependence between the cultural and phylogenetic bases of development. In developmental genetics, increasing recognition is being given to the fact that the genetic regulation of development is to a considerable extent mediated by behavioral systems (e.g., Gottlieb, 1992). Individuals choose and create their environments according to preferences and competencies that, as phenotypic dispositions, are linked to genotypic factors; such dispositions also influence the ways in which individuals respond to environmental influences to which they have exposed themselves selectively (e.g., the concept of "active genotype-environment covariation"; Scarr & McCartney, 1983; see also Plomin, 1986). Through their actions, individuals form, and continually transform, their phenotype and extend it into their personal culture and developmental history.

Personal Regulation of Developmental Processes

The cultural regulation of human ontogeny is closely intertwined with, and in part mediated by, processes of intentional self-development. The active subject is a constitutive and productive element of the cultural system, which is continually realized, maintained, and reformed through personal action. At the same time, individual action in its physical and symbolic aspects is inherently bound to the action space of a culture; it is

through transaction with the cultural context that individuals construe prospects of possible and desired developmental courses and acquire the knowledge and means to implement these prospects.

Culture, therefore, is not a system of forces that is intrinsically opposed to self-development, as alienation literature since Rousseau has maintained; rather, cultural contexts both constrain and enable self-regulatory processes. Cultural demands and affordances may be more or less congruent to and often conflict with the individual's developmental goals and potentials. The relational pattern of personal and contextual constraints of development is continually redefined and transformed in the course of cultural evolution and individual ontogeny. These changes, which occur in historical as well as in personal-biographical time, permanently induce conflicts and discrepancies in the transaction between the developing individual and the cultural ecology: Developmental tasks, role expectancies, or performance standards may overtax the individual's developmental resources; social opportunity structures may impede realization of personal goals and identity projects, and so on. As dialectic approaches have emphasized (e.g., Kesselring, 1981; Riegel, 1976), such discrepancies and conflicts are driving forces in cultural evolution as well as in the individual's development over the life span because they promote readjustments and new syntheses within the system in which they originate.

Individuals can respond to these adaptive problems in a variety of ways. They can adjust personal goals and projects to situational constraints and resources, or, conversely, attempt to modify external circumstances to suit personal interests and capabilities; they may try to evade or neutralize normative demands, or accommodate to them. Such adaptive activities generally aim at reducing discrepancies between factual or perceived courses of personal development and the person's normative conception of self and future development; they also serve to stabilize and maintain personal identity, thus displaying the functional characteristics of autopoietic processes through which living systems maintain and perpetuate themselves (e.g., Brandtstädter & Greve, 1994; for an explication of the concept of *autopoiesis,* see Maturana & Varela, 1980; Zélény, 1981).

These considerations support and illustrate the argument that processes of intentional self-development are integral to human ontogeny over the life span. However, one should be aware that these processes, like any human activity, involve elements beyond personal control. We organize our life and activities within a sociocultural matrix that structures and constrains personal action and development; our possibilities to alter these contextual constraints are limited. We even have limited influence on the "inner" context of our actions; in particular, we cannot deliberately change our own motives and beliefs (e.g., Brandtstädter, 2000; Gilbert, 1993). Action-theoretical stances here reach limits that have to be carefully fathomed. Finally, one should not discount the influence of accidental, uncontrollable events and "chance encounters" (Bandura, 1982a) in any individual life history, although, even here, some degree of control may be involved, as individuals may deliberately expose themselves to or actively seek risks or chances.

From the point of view of the acting subject, development over the life span appears as a blend of expected and unexpected, controlled and uncontrollable elements, or as a story of gain and loss, of success and failure (Baltes, 1987; Brandtstädter, 1984a). Efforts to keep this balance favorable are essential aspects of human activity. Individuals differ in the degree to which they feel able to alter the course of personal development, however, and such differences profoundly affect the emotional attitude toward self and personal future; feeling incapable of achieving desired developmental goals, or of becoming the person one wants to be, is largely coterminous with depression and loss of meaning in life.

Historical Notes

Action approaches to human development have a long history that can be traced back to antiquity. The idea that human beings make themselves is already expressed clearly in the philosophical work of Aristotle, who conceived of action as the process by which the person transforms self and life in accordance with ideals of rationality (Müller, 1982). In the Renaissance, self-formation and self-perfection flowered and even became a dominant form of life. The Renaissance ideal of *uomo universale,* of the individual who strives for self-perfection in all areas of development, resounds in the works of Shaftesbury, Herder, Schiller, and Goethe (Spranger, 1914); Tetens' notion concerning the "perfectibility" of human development, which was mentioned earlier, is still clearly influenced by this ideal. Giambattista Vico (1725/1948) even based his philosophy of history and culture on the argument that we can truly understand only what we ourselves have created (see also Bunge, 1979).

In early German psychology—especially in the philosophically oriented branch of "understanding" psychology (Dilthey, 1924; Spranger, 1914)—human development had always been conceived as a lifelong process of active self-development (Höhn, 1958). In Charlotte Bühler's conception of development during the life course (Bühler, 1933; Bühler & Marschak, 1969), the theoretical focus was on success and failure in concretizing and realizing life goals, the outlines of which emerge already in childhood and adolescence. However, early concepts of intentional self development were strongly loaded with connotations of freedom and spontaneity, and generally implied an anticausalist methodological stance. Such positions did not find fertile soil in a discipline that identified itself increasingly with the methodological ideals of the natural sciences (e.g., Cairns, 1983; Reinert, 1976).

In particular, it was the rise of behaviorism with its explicit antimentalist stance that impeded the broader reception and further development of action perspectives. This remains true despite the fact that it was the behaviorist program that promulgated an almost unlimited manipulability and modifiability of developmental processes (Bijou & Baer, 1961; B. F. Skinner, 1953; J. B. Watson, 1930). It was in the behaviorist framework, too, that the themes of self-control and self-regulation were first addressed systematically. From the behaviorist point of view, self-regulation boils down to a process by which individuals control their own behavior through manipulating stimuli and reinforcement contingencies: "When a man controls himself . . ., he is behaving. He controls himself precisely as he would control the behavior of anyone else—through the manipulation of variables of which behavior is a function" (B. F. Skinner, 1953, p. 228). A theoretical stance that rejects mentalistic terms such as personal goals, beliefs, or intentions as explanatory concepts, however, can hardly grasp those very issues that are of central interest to an action perspective; namely, the connection of personal development with the system of meanings, institutions, and norms that constitutes cultural contexts as well as personal activities in cultural settings.

In psychology, interest in these topics has been renewed by the so-called cognitive revolution of the 1950s and 1960s. The philosophical and epistemological critique of methodological behaviorism (e.g., Putnam, 1975) has further contributed to dispelling the skepticism that has surrounded the action concept. Today, action-theoretical approaches figure prominently in many domains of research. Moreover, the traditional dichotomies of explanation versus understanding, freedom versus determinism, or causalism versus intentionalism have lost much of their adversarial fervor; philosophical positions that plea for compatibility or, at least, peaceful coexistence between these stances have been advanced (e.g., Davidson, 1980; Dennett, 1987). The resurgence of cultural perspectives in psychology, and an increased theoretical concern with the cultural bases of behavior and development—Bruner even presages an impending "contextual revolution"—finds a natural ally in action-theoretical approaches:

> A cultural psychology, almost by definition, will not be preoccupied with "behavior" but with "action," its intentionally based counterpart, and more specifically, with *situated action*—action as situated in a cultural setting, and in the mutually interacting states of the participants. (Bruner, 1990a, p. 15)

THE CONCEPT OF ACTION

Unfortunately, or not, the attempt to explicate the concept of action cannot proceed from a single or unitary theoretical frame of reference. Action-theoretical formulations have been advanced in such diverse fields as psychology, sociology, anthropology, biology, philosophy, or economics; and even in these disciplines, concepts of action come in different shapes.

In the narrower domain of psychology, we can roughly distinguish between structural, motivational, control-system, and social-constructivist action theories.

Structural Theories of Action

This family of theories centers on the structural analysis of actions. There are different formats of structural analysis and it is not always possible to separate them clearly. One line of research has focused particularly on the formal structure of actions and of the cognitive operations underlying action; this approach is represented by the work of Piaget (e.g., 1970, 1976). Other approaches have centered more strongly on the componential analysis of specific activities and skills (e.g., Fischer, 1980; Mascolo, Fischer, & Neimeyer, 1999). Yet another variant of the structural approach is instantiated in the analysis of basic syntactic features that constitute

different types of actions, such as their actors, instruments, goals, objects, and further contextual elements (e.g., Aebli, 1980; Bruner, 1982; Fillmore, 1968; Schank & Abelson, 1977).

Motivational Theories of Action

Influential action-theoretical formulations have been advanced in motivational psychology, perhaps the most prominent being the expectancy-value models of action originating from the work of Tolman and Lewin (for overviews, see Feather, 1982; Krampen, 1987a). According to the basic explanatory scheme of this approach, actions are explained and predicted as a joint function of (a) personal expectations related to action-outcome contingencies, and (b) the subjective evaluation of expected consequences with regard to personal goals and standards. Different variants and extensions of this basic model have been proposed (e.g., Ajzen, 1988; Atkinson, 1970; Fishbein & Ajzen, 1975; H. Heckhausen, 1989; Vroom, 1964).

Control-System Theories of Action

In the tradition of G. A. Miller, Galanter, and Pribram (1960), this type of action-theoretical approach draws on cybernetic and systems-theoretical concepts. The basic analytic tool is the feedback cycle: Processes related to the transformation of goals into behavior and to the regulation of goal-related activity are described as hierarchically organized levels of discrepancy-reducing feedback loops (e.g., Carver & Scheier, 1981, 1998; Ford, 1987; Powers, 1973).

Social-Constructivist Concepts of Action: Activity Theory

A largely autochthonous strand of action research has emerged in the former USSR from the work of Vygotsky and his pupils (Leont'ev, 1978; Luria, 1979; Vygotsky, 1934/1986). Based on the tenets of dialectical materialism, this approach has a strong sociohistorical orientation. Goal-directed activity is seen as the mediator between external reality and individual consciousness; cognitive structures develop from the individual's interaction with cultural symbols as well as with material objects and tools, which, as objectified ideas and problem-solutions, organize thought and action (see also Cole, 1978; van der Veer & Valsiner, 1991; Wertsch, 1981).

This classification cannot claim to be exhaustive; there are no sharp boundaries between the theoretical clusters and there is a broader spectrum of research programs that, to various extents, borrow or integrate elements from the theoretical families described earlier. Such programs focus on, for example, social-cognitive aspects of action (e.g., Bandura, 1986, 1997), on cultural-symbolic perspectives (e.g., Boesch, 1980, 1991; Bruner, 1990a, 1990b; Valsiner, 1998), or on processes related to the formation and implementation of actions and action plans (e.g., Frese & Sabini, 1985; Gollwitzer & Bargh, 1996; Kuhl & Beckmann, 1985; von Cranach, 1982). Influential contributions to action theory have also been advanced in neighboring disciplines, particularly in sociology (e.g., Bourdieu, 1977; Parsons & Shils, 1962; Schütz, 1962) and in anthropology (e.g., Geertz, 1973; Gehlen, 1955/1988; Tyler, 1969). Last, analytical philosophy of action has contributed significantly to elucidating the action concept (for overviews, see, Brand, 1984; Care & Landesman, 1968; Moya, 1990). Some of the earlier-mentioned theoretical positions have been cast from the outset in a developmental framework or are framed as developmental theories; this is particularly true for structuralist and social-constructivist approaches. These approaches contribute important elements to a more comprehensive theoretical perspective of intentional self-development, which is outlined in later sections.

These introductory comments should make it clear that the different theories and research programs centering on the concept of action do not form a coherent system. Given the inherently cross-disciplinary nature of the action concept, the vision of a grand unifying action theory seems utopian. This compromises any effort to formulate consensual definitions. To elucidate the concept of action, I concentrate in the following on some general and rather uncontroversial elements that seem particularly relevant for conceptualizing the interdependencies between action and development.

Explicating Action: Conceptual Constituents

Is it possible to identify a set of essential and discriminative features that is common to all instances of actions, and that separates actions from other forms of behavior that would not count as actions? When speaking of acts, actions, or action-like activities, we obvi-

ously do not refer indiscriminately to any behavior but to behaviors that can and should be explained and predicted in a specific way. We seem to imply that the observed behavior has been chosen by the individual because of personal beliefs and values, and that it can be interpreted as serving some personal goal or as expressing personal attitudes and values. Accordingly, when accounting for actions, we try to show how they are linked with the actor's values, beliefs, attitudes, or competencies. When interpreting an observed behavior as an action or particular type of act, we suppose that the actor "could have done otherwise" (Chisholm, 1966), and that he or she was sufficiently free to refrain from the behavior (even nonbehaving sometimes can be considered as an action). Conversely, behavioral events that are beyond personal control seem not to qualify as actions; physiological reflexes, emotional reactions, and all forms of inadvertent or erroneous behavior (slips of attention, lapses of memory, and so on) are typical examples. These differentiations are also fundamental to moral and ethical evaluations; according to the conceptual rules inherent to moral discourse, standards of justice, rationality, or responsibility apply only to intentional and personally controlled behavior, not to nonintentional behavioral events (Austin, 1956).

There is no one-to-one correspondence between behaviors and actions; a given behavior, taken as an observable physical event, is often only one of several components that constitute an action (Thalberg, 1977). For example, an action of greeting can be instantiated through a multitude of physically different behaviors (i.e., through waving the hand, nodding the head, uttering a verbal formula); in turn, a given behavior such as waving the hand may instantiate such different actions as greeting, giving a signal, or chasing away a mosquito depending on the "inner" context (the individual's intentions, beliefs, and so on), situational specifics, as well as on the system of symbols, social norms, and conventions according to which certain behaviors in certain situations instantiate a specific action. To categorize a given behavior as a specific type of action thus generally involves an interpretative process that transcends the immediate observable givens; in this sense, actions may be conceived of as interpretative constructs (Lenk, 1981). Occasionally, a distinction is made between actions and acts in which the term *acts* is taken to denote the generic category or type of actions to which a given action belongs (e.g., Harré & Secord, 1972). Again, the same generic act can be instantiated through different actions, and the same action can instantiate different acts. To count as instantiations of some act or type of action, different actions must bear some structural semblance to one another: They have to possess those features that, according to conventions and conceptual rules, are constitutive for the respective act type. Parenthetically, this point is fundamental to the construction of developmental continuity and coherence, which often involves establishing structural or "homotypic" equivalence (Kagan, 1971) between phenomenally different behaviors at different ontogenetic levels.

In a first approximation, we may thus consider criteria such as intentionality, personal control, reflexivity, and (perceived) freedom of choice as defining actions (e.g., Groeben, 1986; T. Mischel, 1969). However, none of these criteria is without problems. Considering the criterion of intentionality, intended action outcomes often imply undesired or harmful side effects that are simply tolerated; people may be held morally and legally responsible for such condoned effects even when they did not focally intend them. There are also cases of reduced intentionality, for example, when someone doodles aimlessly on paper while making a phone call. The criterion of personal control has its complications as well. There are many nonintentional behaviors, such as physiological reflexes, that we can control in a technical sense; for example, we can deliberately induce sweating by exposing ourselves to higher temperatures. It does not follow that such physiological reflexes are actions (although the instrumental activities by which we brought about the response certainly are). It is also true that actions in any phase involve component processes that are not under personal control; we would have no control over our own behavior and development without the helping hand of mediating mechanisms that lie beyond our control. As already intimated, we even do not have full command over the internal context of our actions; thus, we are not at liberty to intend, wish, or believe whatever we want to believe, wish, or intend (e.g., Kunda, 1990; Lanz, 1987).

Within the confines of this chapter, I cannot dwell on the conceptual intricacies surrounding the notion of action (for a more detailed discussion, see, Greve, 1994; Moya, 1990). For the present purpose, the earlier considerations may be condensed in a working definition: *Actions may be conceptualized as behaviors that (a) can be predicted and explained with reference to intentional states (goals, values, beliefs, volitions); (b) are at least partly under personal control, and have been selected*

from alternative behavioral options; (c) are constituted and constrained by social rules and conventions or by the subject's representation of these contextual constraints; and (d) aim to transform situations in accordance with personal representations of desired future states.

This definition again underscores the intimate relation between action and personal development. Self-referential actions that are intentionally related to personal development, however, have additional properties that are delineated in later sections. Before addressing these issues, I attempt to give a more detailed account of how personal and social factors intertwine in the regulation of action.

Constraints of Action: Constitutive and Regulative Rules

Human action is related to rules in a twofold sense. In a first and familiar sense, actions and personal action spaces are *constrained* by rules; in a second and more fundamental sense, actions—or at least some actions—are *constituted* by rules. Following Searle (1969), one can differentiate between regulative and constitutive rules (the distinction can be traced back to Kant; see also Brandtstädter, 1984b; D'Andrade, 1984; M. J. Smith, 1982; Toulmin, 1974).

Regulative Rules

Personal action is regulated by a variety of cultural prescriptions and restrictions, and these can be more or less formal and explicit (laws, norms, customs, social expectations, etc.). Such rules delimit situationally defined zones and margins of action. The limits imposed by regulative rules, however, are not rigid; cultural laws, in contrast to natural laws, can be violated. Regulative rules, however, have "normative force" (Toulmin, 1969); they are linked to subsidiary social forces such as sanctions or patterns of reinforcement that tend to increase the frequency and probability of rule-conforming behavior. Regulative rules, whether they are externally imposed or "internalized" and integrated into the processes of self-regulation, generate regularities in patterns of action and development. For example, the developmental tasks or normative timetables which determine the proper scheduling of biographical events in social contexts (e.g., Chudacoff, 1989; Neugarten & Hagestad, 1976) define systems of regulative rules that institutionalize and synchronize individual life courses and thus impose order and regularity on development.

Constitutive Rules

When considering acts or action episodes such as marrying, formulating an excuse, promising something, or taking a penalty kick, it is evident that such actions are not simply regulated, but, in a stronger sense, are *constituted* by rules. Just as one can play chess only within the framework of chess rules, one can marry someone, give a promise, and so forth. Only according to specific semantic rules and social conventions that define, at least in outline, in which ways and under which contextual circumstances an action has to be performed to count as a valid instantiation of that particular act. Describing or understanding an action as an instance of a generic act presupposes familiarity with the corresponding constitutive rules (Winch, 1958). The rules that constitute particular acts are represented individually in scriptlike cognitive structures or schemas (Schank & Abelson, 1977). These scripts or schemas enable us to organize our activities according to socially shared meanings, and to extrapolate, anticipate, and coordinate courses of action in social settings.

Through constitutive rules, certain types of action are linked inseparably to cultural institutions. As D'Andrade (1984) has pointed out, changes in institutional contexts alter the range of possible actions, eventually creating radically new types of action:

> One consequence of constitutive rule systems is the enormous expansion of the behavioral repertoire of humans compared with the behavioral repertoire of other animals. For example, without the system of constitutive rules called football, the behaviors of scoring, blocking, passing, and so on would not exist. (p. 94)

Regulative and constitutive rules provide important vantage points for reconstructing developmental regularity and invariance from an action-theoretical point of view. The constitutive rule concept in particular offers a fresh perspective on the traditional theme of developmental universals; as I show later, the formal or conceptual rules that determine the structure of particular skills and competencies also impose order on the ontogenetic construction of the corresponding competencies.

The Polyvalence of Actions

The concept of polyvalence is related to the valence concept in Lewinian theory; it refers to the fact that one and the same action can serve different purposes and in-

tentions and correspondingly can have, and usually has, multiple meanings at both personal and public levels. For example, the person who quits smoking can do so for health reasons, to avoid social conflicts, for financial reasons, to demonstrate willpower, or for some combination of such reasons. Actions or action tendencies mostly result from a mixture of instrumental, symbolic, expressive, and aesthetic valences, which may sometimes conflict:

> Polyvalent means three things: first, actions, aiming at composite goals, are "over-determined"; second, they connote different areas of experience; and, third, they draw their justifications not simply from the concrete specific results they (tend to) achieve, but also from the subjective experiences implied, from personal fantasms, cultural rules and values. (Boesch, 1991, p. 363)

From the polyvalent (or polysemous) nature of actions, it follows that one and the same basic action can simultaneously instantiate a multitude of different acts. When Mr. Doe mows the lawn, he is cutting the grass, making noise, and exercising his muscles; by doing this, he is—depending on the given causal, social, and symbolic context—perhaps pleasing his neighbors, evading conflicts with his wife, showing a sense of responsibility, and so forth (Rommetveit, 1980). Some of these effects and implications may be intended, others may be simply tolerated or even remain unnoticed. To capture the multiplicity of levels on which a given action can be described, Goldman (1970) has coined the metaphor of an "act tree" whose branches are generated through causal mechanisms, conventions, or language rules. The ways in which actors construe the effects and implications of their own activities, and describe their actions, may differ from the interpretations of external observers. Such differences may give rise to social conflicts and identity problems, the solution of which often requires negotiation of consensual interpretations. Negotiating meanings is a basic strategy for establishing consensus and co-orientation between developing individuals who have to coordinate their actions and developmental goals in, for example, martital relationships or family systems (Berger, 1993; Brandtstädter, Krampen, & Heil, 1986). As is evident from these considerations, the meanings and motivating valences of actions, even of everyday activities, can be and often are ultimately rooted in global identity goals and life themes.

Different kinds of knowledge and expertise, and corresponding developmental steps, are is required for a differentiated representation of the meanings and effects of action: Knowledge about the causal structure of action spaces is required for gauging possible action-outcome contingencies whereas the construal of semantic or symbolic implications requires corresponding conceptual knowledge. The polyvalence of actional meanings also implies emotional polyvalence; when different interpretive schemes can be applied to a personal or observed action, different or "mixed" emotional evaluations may result. For example, an aggressive action may be coded as an act of self-assertion, as an infringement of moral norms, as a lapse of self-control, and may simultaneously invoke feelings of pride, guilt, or shame. The emergence of such mixed feelings appears to be an ontogenetic marker of the individual's developing ability to represent the causal and semantic implications of observed events and behaviors (Harter, 1986).

Self-control and intentional self-development crucially hinge on the construction and deconstruction of meanings and evaluative standards. Human actors can take an evaluative stance with respect to their own intentions, emotions, and actions; for example, we may experience feelings of pride or shame with regard to our own feelings. Such metaemotions or second-order evaluations are characteristic for a higher ontogenetic level of action regulation, a level on which moral principles, social norms, and personal representations of "ought selves" (Higgins, 1988) become integrated into the process of intentional self-development (see also Frankfurt, 1971). Again, ontogenetic requirements should be noted. The polyvalence of actions reflects the embedding of individual behavior into a hierarchy of contextual levels that—to borrow terms from Bronfenbrenner's (1979; Bronfenbrenner & Morris, 1998) model of developmental ecologies—extends from the encompassing macrosystem of cultural institutions, norms, and symbols through intermediate mesosystems down to the social and physical microsystems that constitute the proximal setting for the individual's activities. The representation of meanings proceeds ontogenetically in a sequence that corresponds to the increasing abstractness and complexity of the contextual levels in which actions are situated. Whereas early in development, the focus for evaluating one's actions is primarily on perceived and anticipated effects in the immediate or proximal environment (e.g., reactions of parents or peers), the evaluative scope widens on subsequent developmental stages so that more complex and abstract system perspectives become progressively influential in self-regulation (see

Eckensberger & Reinshagen, 1980; Edelstein & Keller, 1982; Harter, 1983; Selman, 1980).

The Context of Action

Psychological action explanations primarily center on the "inner" context of action: on the individual expectations, goals, beliefs, and so forth that determine the intentional structure of action. This explanatory focus, however, provides only a reduced, largely ahistorical, and adynamic picture of action that is of limited use for developmental theorizing. To appreciate how an individual's life history relates to the patterning of personal goals, projects, and actions across the life course, external contextual conditions must be taken into account. The blending of intended and unintended, expected and surprising outcomes that makes up any biography is essentially determined by the external context of action and its physical, material, and social constraints.

People generally have only limited insight into the contextual conditions of their behavior. The complexity of the causal and symbolic structures that generate meanings and effects of action generally exceeds the representational capacities of the individual actor; unintended and unexpected effects are intrinsic to the reality of action under conditions of "bounded rationality" (Simon, 1983). Though the aspect of unintended consequences has been largely neglected in psychological and philosophical accounts of action (see Giddens, 1979), it has profound implications from a developmental point of view. The experience of unintended or unexpected effects provides an impetus for the revision and continuing adjustment of individual goals and beliefs; surprise induces exploratory activities through which the inner context of an action is modified and accommodated to external constraints. Unintended effects, and the ways in which individuals cope with them, are dramatizing elements in any personal biography (Bruner, 1990a); they shape future action spaces and developmental options, and provide a corrective for the theories and beliefs that individuals hold about themselves and their environment.

As cultural artifacts, action contexts are to a large part the result of individual and collective actions. Cultures provide means and prosthetic tools to maximize intended effects of actions and to suppress unintended side effects of actions; they create norms and institutions to coordinate the actions of individual actors so that they become mutually compatible. Beyond this, individuals themselves actively control the texture of their action space; actors have an interest in making effects or meanings of their actions converge with their intentions, and they strive to organize the personal action space accordingly. If such efforts fail, individuals may select an ecological niche (Super & Harkness, 1986) that fits better with their intentions or developmental goals. Through these selective and constructive activities, personal action contexts become extensions of the actor's self (e.g., Brandtstädter, 2001; Csikszentmihalyi & Rochberg-Halton, 1981; Thomae, 1968).

In general, individuals select and organize contexts and fields of activity according to a principle of "just manageable difficulty" (G. Brim, 1992). In early childhood, this selection is typically under the control of adult caretakers. Parents structure the activities of the child through limiting access to certain situations and experiences, as well as through encouraging or supporting particular activities; they create "zones of free movement" and "zones of promoted action" (Valsiner, 1987a) that are more or less adjusted to, but at the same time also shape, the "zone of proximal development," that is, the next developmental tasks or steps that a child has partially mastered already but the successful completion of which still requires external support (Vygotsky, 1978; Wertsch, 1984). This structuring of action zones provides a scaffold that organizes and directs developmental progress; examples can be found in the organization of the child's action spaces during meal times or of toddlers' climbing activities (Gärling & Valsiner, 1985; Valsiner 1988a, 1988b).

Harmonizing contextual demands and resources with personal goals and developmental potentials is in itself a fundamental theme of intentional self-development (Kahana, Kahana, & Riley, 1989). Because both external (physical, social, symbolic) contexts and personal resources of action (values, interests, competencies) are involved in historical and ontogenetic change, this mutual accommodation remains a concern over the entire life span, and developmental problems often result from poorness of fit between (or within) these systems of influences at different developmental stages (Brandtstädter, 1985a; Chess & Thomas, 1984; Lerner & Lerner, 1983; Thomas & Chess, 1977). Critical events and transitions in the individual's life course involve particularly strong pressures to revise action spaces and developmental goals. In later life, the changes and limitations of action resources, which typically accompany the processes of aging, enforce readjustments of per-

sonal projects and activities. The importance of such adaptive dynamics for buffering experiences of loss and for preserving a positive view of self and personal development has become a topic in developmental and gerontological research over the past years (e.g., Baltes & Baltes, 1990; Brandtstädter & Renner, 1990). I address this in a later section.

The extent to which external contextual constraints fit, or can be made to fit, with personal interests and potentials deeply affects the long-term balance of successes and failures, or of developmental gains and losses, in the individual's life history. Recurring experiences of noncontingency between one's actions and contextual effects undermine a sense of personal control and self-efficacy and may foster a tendency to avoid tasks and developmental options that involve a risk of failure; yet, it is precisely these challenges that afford opportunities for further personal development (Bandura, 1981, 1997).

DEVELOPMENTAL DIVERSITY AND REGULARITY: ACTION-THEORETICAL RECONSTRUCTIONS

The search for coherence and lawful regularity in human development is a traditional heuristic ideal that has inspired developmental psychology from its very beginnings: "From the colourful play of human changes, we must go back to an invariant order, back as far as possible to the eternal source of phenomenal variation" (Carus, 1823, p. 94; trans. J. B.). This ideal can be traced back to the philosophical teachings of Parmenides (540–480 B.C.) and Plato (427–347 B.C.): For Parmenides, the phenomenal world in all its diversity was merely the appearance of one immutable substance, whereas Plato considered empirical phenomena to be the reflection or imperfect instantiation of timeless and unchanging ideas (see also Toulmin, 1977).

To what extent are action-theoretical perspectives compatible with this influential epistemic stance? At least at first glance, it appears that the rise of action perspectives signals the demise of a Parmenidean or Platonic stance; the arguments that strengthen the latter seem to weaken the former, and vice versa. First, a research heuristic aimed primarily at the disclosure of universal ontogenetic principles tends to detract from the institutional, symbolic, subjective-intentional conditions of development—conditions that seem to breed diversity rather than regularity in human ontogeny (Shweder, 1990). Second, the search for universal laws in ontogeny has not been an extraordinary success, to put it mildly; it has generated massive evidence apparently speaking against the assumption of lawful regularities in development. Thus, longitudinal investigations have documented considerable variability and heterogeneity in developmental patterns for many behavioral domains; correspondingly, long-term predictions have evinced a high degree of indeterminacy (Baltes, Reese, & Lipsitt, 1980; Lerner, 1984; Rutter, 1984; Schaie, 1983). Likewise, there is only scarce support for the traditional claim that personality development over the life course is shaped profoundly by early childhood experiences, as has been argued by psychoanalytic theory and partly also by learning theorists (Clarke & Clarke, 1976; Oyama, 1979). O. G. Brim and Kagan (1980, p. 13) have aptly described the situation: ". . . growth is more individualistic than was thought, and it is difficult to find general patterns."

Not surprisingly, these research experiences have strongly encouraged theoretical views that programmatically emphasize the discontinuous, contextualized, and aleatoric (i.e., coincidental or random) character of development over the life span (Baltes & Reese, 1984; Baumrind, 1989; Emde & Harmon, 1984; Gollin, 1981; Lerner, 1984). There even have been claims as to the basic futility of any search for universality and invariance in ontogeny (e.g., Gergen, 1980; Shweder, 1990). However, a note of caution is required here: As long as we cannot rule out that difficulties in extracting structure and law-like regularity from developmental diversity merely reflect theoretical deficiencies, it would be a weak argument to simply attribute such difficulties to an allegedly unpredictable or inchoate nature of development. Allusions to the fundamental indeterminism of phenomena in quantum physics that recently have become trendy among developmentalists do not seem to be tenable; it may suffice here to note that the uncertainty principle in quantum physics is not a declaration of theoretical ignorance but a powerful predictive device. In any case, it would be a logical mistake to equate lack of evidence for lawful regularity with evidence for the lack of such qualities. Coherence and universality in development are not observable facts that can be established conclusively; these qualities emerge only by way of theoretical abstraction. In a similar way, plasticity and modifiability are not features that characterize development

in an essential or fundamental sense; they have to be conceived as qualities that relate to potentials of change and modification in a given cultural and historical frame.

The Construction and Deconstruction of Developmental Coherence

To account for continuity and coherence in developmental patterns, it is usual to invoke causal mechanisms (e.g., Overton & Reese, 1981). A causal or deterministic stance, however, is rendered problematic by the fact that developing organisms have to be conceived as open systems (see also Ford & Lerner, 1992). Only in a system that is closed to external influences can there be causal chains such that subsequent states are linked in a necessary and invariant fashion; the developing organism, however, is functionally coupled to its physical and social environment by the continuous interchange of stimulation and information. Defenders of a determinist stance might argue that such difficulties could be handled simply by expanding the analytic perspective: "If determinism is assumed, alterations in a system which do not appear to occur as the consequence of the presence or operation of antecedent factors or conditions, must be regarded as belonging to a more inclusive system which is deterministic" (Nagel, 1957, p. 17).

If we widen our explanatory scope to include the physical and social ecologies of development, however, it becomes obvious that regularities in human development are not brought about by causal laws alone but, to a considerable extent, reflect the ways in which institutions, collective agents, and the developing individuals themselves, purposefully or inadvertently, make use of such laws. If the notion of causality is taken to refer to invariant sequences of events in which some antecedent condition inevitably generates some consequence (e.g., Bunge, 1979), the regularities that characterize human development as a product of personal and collective action can hardly be described that way. In cultural contexts, developmental regularities are in large measure patterned and mediated by individual and institutionalized actions, and, by consequence, can also be transformed or suppressed through action. For example, connections between risk factors in early development and unfavorable developmental outcomes generally depend on moderating or mediating variables such as prevailing attitudes in the social environment or the availability of preventive and therapeutic resources (e.g., Busch-Rossnagel, 1981); likewise, age-related decrements in memory, physical stamina, health, and so forth will be expressed more strongly in contexts (and individuals) in which the motivation, knowledge, or resources to counteract functional loss are lacking (Baltes & Schaie, 1974; Salthouse, 1987). A particularly intriguing example of how a seemingly inevitable causal sequence can be broken up through interventive action is the inherited metabolic disease of phenylketonuria (PKU). Formerly, PKU invariantly led to severe mental retardation; today, the metabolic mechanisms involved are sufficiently known so that it has become possible to avoid insidious developmental consequences by a proper dietary regime. The list of examples obviously could be extended *ad libitum.*

Developmental regularities in actional contexts essentially arise from personal and institutionalized agentivity. Thus, the tendency in a given social or personal context *C* to produce or forestall a specified developmental outcome or pattern *D* can be conceived as depending on available resources of intervention, on the cost of such interventions, as well as on the value (which may be positive or negative) that *D* has in *C* (Brandtstädter, 1984c). Accordingly, we would expect that for developmental domains that are amenable to control, transitions from socially undesirable states to positively valued states should be more frequent or probable than the obverse transitions. Consistent with this assumption, longitudinal observations suggest that in regard to traits that are socially recognized as positive, the probability that children at lower levels on the trait later come up to a higher level is greater than the reverse case; likewise, socially deviant behaviors seem to show less developmental stability than behavior that conforms to social norms (Kagan & Moss, 1962; Kohlberg, LaCrosse, & Ricks, 1972). Longitudinal findings also hint, for example, that the probability of a delinquent adolescent exhibiting socially deviant behavior in adulthood is lower than the reverse, retrodictive probability (Rutter, 1984). By the same reasoning, we may infer from the frequent or regular occurrence of a negatively valued developmental pattern or outcome a lack of pertinent preventive knowledge or resources; this argument also accounts for the observation that developmental losses in later life are perceived as less controllable when they involve positively valued domains (J. Heckhausen & Baltes, 1991).

Even biology and developmental genetics no longer provide a safe retreat for deterministic views of invari-

ance and ordered change in development. The genome does not rigidly determine a developmental phenotype. Rather, it defines the norm of reaction or the function that, for a given genotype, maps possible environmental influences onto phenotypic outcomes; "genes . . . code for a range of forms under an array of environmental conditions" (Gould, 1981, p. 56; see also Gottlieb, 1992). From this point of view, developmental patterns appear as genetically fixed only as long as relevant epigenetic conditions are held constant or within critical margins. If we define the heritability of a given developmental phenomenon as the portion of phenotypical variance that is accounted for by genetic sources, the obtained estimate is not a natural constant, but depends crucially on the range of variation in critical environmental conditions that is produced or tolerated in a given cultural context. Ethical norms and codes of justice, for example, limit inequalities in the distribution of developmental resources, public health measures restrain detrimental influences, and theoretical and technological progress permanently spawns new means of preventive and corrective intervention into human ontogeny. Accordingly, the relative portions of phenotypic developmental variation accounted for by genetic and exogenous influences, respectively, can change over a shorter or longer historical interval; but "change the mix and the answers change" (Plomin, 1986, p. 7). Seen from an action perspective on development, heritability coefficients provide only limited evidence as to the lesser or greater external modifiability of a developmental trait; rather, they reflect propensities and limitations in developmental ecology to control critical epigenetic influences (Brandtstädter, 1984b; Lerner & von Eye, 1992; Scarr, 1982).

Developmental Plasticity: Weak and Strong Constraints

The earlier considerations suggest the following proviso when framing propositions about developmental regularities: No developmental tendency exists that cannot be altered, provided that the individual or collective agents concerned both want to alter it and possess the appropriate means to do so (see also Watkins, 1957). On closer examination, this proposition turns out to be irrefutable; it is true by virtue of its logical form alone. It does not implicate, however, an unlimited plasticity or modifiability of human ontogeny, neither are all developmental modifications possible nor are all possible variations desirable or permitted.

We can differentiate between weak and strong constraints on the range of developmental trajectories, that is, between constraints that themselves are, at least in principle, open to change, and those that, for strong reasons, are not. Strong, if also very wide, constraints are imposed on development by the laws of logic (e.g., through logical and mathematical structures); developmental outcomes that involve logical contradictions or combine logically opposed states are a priori impossible. Natural laws also constrain the space of possible developmental phenomena in a strong sense. Human beings are both personal actors and, at the same time, organic systems that are subject to physiological, biochemical, and biophysical laws. These laws can eventually be exploited to generate desired developmental outcomes through deliberate manipulation of antecedent conditions, but they cannot be altered, for reasons inherent to the very notion of a natural law. Developmental trajectories necessarily remain in the limits imposed by natural laws, which are narrower than those imposed by logic.

In contrast, the values, technologies, and theories that provide the orienting framework for social and personal regulation of development are not fixed or rigid in a strong sense, but are factually or in principle open to change. The limits of what is possible and desirable in human development are continuously redefined and renegotiated in the process of cultural evolution; it is certainly not by accident that the progressive expansion of cultural resources for developmental intervention and modification coincides with the rise of theoretical paradigms that emphasize the plasticity, multidirectionality, and variability of human ontogeny.

Finally, ontogenetic processes are also constrained by the semantic rules and conceptual structures that are used, in science as well as in everyday contexts, to analyze, and communicate about, development. The semiotic context not only constitutes and constrains spaces of action but also imposes order on developmental sequences. With regard to the distinction between weak and strong limitations, this type of constraint cannot be classified easily. This is an important point that is discussed more closely when turning to the issue of developmental universals.

To summarize these considerations, we may picture the different constraints as a hierarchy of inclusive sets as shown in Figure 10.2 (see Brandtstädter, 1984c):

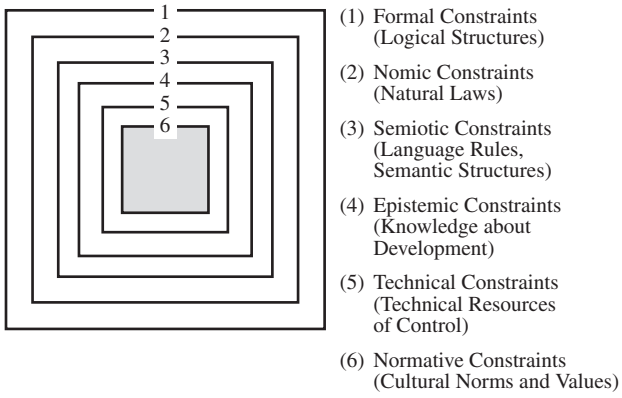


Figure 10.2 Development in action contexts: A system of constraints (see text for further explanation).

From the totality of all logically possible states that a developmental system might assume, only a subset of states is compatible with natural laws and with semiotic constraints; from this subset again, only a smaller portion can be realized within the limits of available theoretical and technological means; and finally, only a selection of developmental pathways that could possibly be realized will also be desired or permitted under prevailing normative constraints (here, the reverse is generally also true). The shaded residual area in Figure 10.2 describes the allowable margins of developmental variation within this system of constraints.

Assumptions regarding developmental phases of higher or lower modifiability play an important role in policy decisions concerning the distribution of educational and intervention resources over the life cycle. Often, such assumptions are based on observed inter- and intraindividual variation in the trait in question. For example, early childhood programs were launched under the premise of a special sensitivity of the early years as compared with later phases in life; this assumption leaned strongly on an analysis of longitudinal variations in the stability of intelligence test scores (e.g., Bloom, 1964; Clarke-Stewart & Fein, 1983). The earlier considerations caution against potential pitfalls of inferring developmental plasticity from observed variation. Because actually observed variation in a developmental trait depends on the affordances, resources, and constraints realized in a given environmental setting, it obviously can provide only a weak estimate of the potential range of variation. As McCall (1981, p. 9) has put it, "the environments not represented in the sample also have implications for the . . . potential for change." To gauge limits of performance and developmental variation, planned experimental interventions seem to offer a stronger basis; efforts to boost memory performance of elderly subjects through mnemonic training may be considered as an example (Baltes, 1993; Kliegl, Smith, & Baltes, 1989). Even through experimental manipulations, however, limits of potential development cannot be determined in any definitive way because the results of such interventions always depend on the theoretical and procedural means available in a given cultural and historical situation, and thus are themselves subject to theoretical and technical limitations.

Invariance and Universality in Development: An Action-Theoretical Account

The notorious difficulties in establishing generally valid developmental patterns reflect the general principle that development—as Hegel (1837/1857) in his philosophy of history once put it—only manifests itself in concrete-historical modifications. Thus, one might suspect that theoretical views that consider context, culture, and intentional action as driving forces in human development are likely to end up in a relativism that renders the search for continuity and universality quixotic (Bruner, 1990b; Gergen, 1980). This is a threatening perspective, at least to those developmentalists who still subscribe to the view that the strength of a theoretical framework comes from its ability to encompass differences as well as regularity and invariance in development (Block, 1971; Brandtstädter, 1984c, 1985b; Lerner, 1984; Rosch, 1977). Expanding arguments from the last section, we explore in the following how the traditional issue of developmental universals may be approached from an action perspective. To preview, an action-theoretical account of invariance and universality differs in some respects from traditional treatments of these issues.

Developmental Universals as Empirical Regularities

As it is commonly used, the notion of developmental universals refers to ontogenetic phenomena manifesting themselves in the same or similar ways across different social, cultural, or historical contexts. Across all cultures, we observe similar structures and sequences in prenatal development, in the maturation of physiological functions, in early sensorimotor development, in language acquisition, in cognitive and affective develop-

ment, as well as in the processes of biological aging (for overviews, see Cole & Scribner, 1974; Kagan, 1981b; Warren, 1980). A theoretical emphasis on diversity and multidirectionality in development should certainly not obfuscate the considerable constancy and transcontextual stability in basic patterns and processes of human ontogeny. Cross-cultural research, with its emphasis on documenting cultural specificity, often tends to overlook the conspicuous commonalities in development (Rosch, 1977).

Although developmental commonalities of the mentioned type emerge across a broad range of environmental variation, they necessarily presuppose constancy in those exogenous influences that have an impact on the given ontogenetic functions. Genetic mechanisms generate similar developmental phenotypes only as long as critical epigenetic influences remain sufficiently stable or—which is the interesting case from an action-theoretical perspective—are actively kept within critical margins. If critical exogenous variations exceed those tolerance margins, for example, as a result of influences that override genetic buffering mechanisms because they occur for the first time in evolutionary history, anomalous developmental patterns emerge: The thalidomide disaster is a dramatic example. The genetic control of ontogenesis presupposes mechanisms and structures that regulate and standardize the distribution, intensity, and temporal patterning of critical exogenous variables. The mediating processes that warrant this epigenetic order involve the selective and constructive activities of the developmental organism itself, as well as the "institutionalized operativity" (Warren, 1980, p. 310) of the social and cultural system. As already stressed, personal and cultural agentivity merge in the regulation of development; both are related to social norms that prescribe and enforce the timing and sequential order of developmental tasks and role transitions across the life span.

An important point that follows from these considerations is that observed regularity of certain ontogenetic forms is not in itself sufficient to establish universality in the strict sense because observations can always cover only a limited range of situations. Even if an empirical rule has been found valid without exception, this does not warrant its universality across time and space; this is the problem of inductive generalization as classically formulated by Hume. Postulates about universal ontogenetic sequences, as they have been set forth in, for example, stage models of cognitive, sociomoral, or emotional development (e.g., Kohlberg, 1976; Piaget, 1970; see also Brainerd, 1978), can eventually be refuted but never be definitively settled on an empirical base alone.

At this juncture, the differentiation between weak and strong constraints of development suggests a corresponding distinction between universality in a weak and a strong sense. Traditional notions of developmental universals, as far as they refer to empirical regularities resulting from commonalities in the social and cultural canalization of development, can at best qualify as universal in a weak sense (even if no exceptions have ever been observed). By contrast, to claim universality in a strict sense, it has to be demonstrated that falsifying events are logically or conceptually impossible, and thus can be excluded on an a priori basis.

Developmental Universals as Structural Implications

As already indicated, the search for universals of human development, at least for universality in the strict sense, is often deemed to be an obsolete research heuristic, being diametrically opposed to a posture that emphasizes the formative impact of context and culture on human ontogeny. However, it seems that consideration of the formal and conceptual structures that constitute development in action contexts opens a fresh perspective on these issues.

The notion of constitutive rules provides a starting point for elaborating this argument. As introduced earlier, constitutive rules establish structural criteria that empirical phenomena must satisfy to count as an instance of certain generic category. According to the constitutive rules defining, for example, the concept of altruism, acts of altruism must involve a sacrifice of own interests to the advantage of others; this feature serves as a criterion to identify altruistic intentions, and it is therefore present in all valid instantiations of this type of act. If there never has been a case of altruistic behavior that did not involve an element of sacrifice, this is not due to some natural law or causal mechanism but reflects constitutive rules that preclude such an event, quite as it would be impossible to "castle" in chess without moving the king two squares toward the rook. In physical theories, we have a similar situation when the measuring of a theoretical variable is based on or derived from some theoretical core assumption; the gathered data cannot disconfirm those parts of a theory whose truth is asserted in the very procedure of observation. According to a structuralist view of theories (Balzer & Moulines, 1980; Balzer, Moulines, & Sneed,

1987), this "theoreticity" of measurements should not be viewed as a methodological weakness but is characteristic of advanced physical theorizing.

Generally, we may assert: When a relationship of the type "If *A,* then *B*" is proposed, and the falsifying event (i.e., the occurrence of *A* without *B*) is excluded for reasons inherent in the formal or conceptual structure—or, as Wittgenstein put it (Waismann, 1979, p. 91), in the "syntax"—of the terms that figure in the proposition, then the proposition becomes a tautology, a statement that is true in all possible worlds. Implications that in this sense structurally preclude the falsifying case may be denoted as *structural implications,* or as propositions involving *implicative structures* (e.g., Brandtstädter, 1987; Lenk, 1987). Structural implications correspond largely with an entailment account of necessary implications as advanced in relevance logic (Anderson & Belnap, 1975). According to relevance logic, the universal validity of necessary implications follows from a relation of entailment in which the meaning of the consequent is nested in the meaning of the antecedent so that a valid verification of the antecedent condition necessarily involves the verification of the consequent. Interestingly, Piaget in his late work has espoused a relevance logic point of view to elucidate the notion of necessity and its ontogenetic acquisition (Piaget, 1986, 1987; Piaget & Garcia, 1983/1991; Ricco, 1993; see also Overton, 1990).

Structural implications may easily be confused with empirical hypotheses, at least as long as the structure of the concepts involved is not analyzed sufficiently. There are numerous examples of such confusions in psychological research (e.g., Brandtstädter, 1982; Kukla, 1989; Smedslund, 1979, 1984). However, drawing firm distinctions between implicative and empirical relations can be problematic; especially when dealing with concepts involving a large array of interpretative specifications ("cluster concepts"; Putnam, 1975), the categorial border between meanings that are structurally implied and empirical correlates of the concept may be blurred (e.g., Brandtstädter, 1987; Lenk, 1987). Despite such reservations, implicative structures offer a vantage point for approaching developmental universals.

The point here is that implicative structures can impose an invariant order on ontogenetic sequences; however, some notes of caution are required in advance to avoid misunderstandings. First, it should be stressed that structural analyses, like empirical ones, are not fail-safe. It is not uncommon, for example, that presumably "logical" ontogenetic sequences actually do not appear (e.g., Carey, 1982; Fischer, 1980); as Flavell (1972) has noted, "the path from logical to developmental priority can be an extremely slippery one" (p. 331). Furthermore, structural analyses can never account for a developmental sequence in any empirical detail. For example, scrutinizing the formal or conceptual implications of a developmental task can yield insights as to the steps involved in the acquisition of the pertinent skills or competencies but may not tell us much about the type of learning experiences or didactic arrangements that might foster this process. By much the same token, structural analyses cannot explain why structurally homologous skills often are acquired at different ages or developmental stages; for example, children develop conservation of substance before conservation of weight, though the tasks have a similar formal structure (e.g., Aebli, 1987; Piaget & Inhelder, 1942/1974).

Paying heed to these caveats, the claim that implicative structures impose an invariant order on ontogenetic sequences should be read as follows: Whenever a developmental state or outcome *D* by virtue of its (formal, conceptual, material) structure entails certain constituent elements *Ci,* than *D* will presuppose *Ci* also in the ontogenetic sequence. It may be an open empirical question whether *Ci* will emerge prior to, or simultaneously with, *D*; but to the extent that the occurrence of *D* without *Ci* can be excluded formally or conceptually, it should be impossible for the same reasons for *D* to precede *Ci* ontogenetically.

In the following, I briefly consider three variants of structural implications that involve different type of structural relationships: (1) formal implications, (2) constructive and conventional implications, and (3) conceptual implications.

Formal Implications

This type of structural implication follows from the formal (logical, mathematical) structure of a given task or competence. As Piaget (e.g., 1970; Inhelder & Piaget, 1958) has shown for the domain of cognitive development, the formal structure of a task is reflected both in the type of cognitive operations necessary for mastering it, as well as in the ontogenesis of these operations. For example, seriating objects according to size presupposes an understanding of the transitivity property of asymmetric relations; balance scale tasks require a grasping of the compensatory relation that holds between the

length of levers and the suspended weights. The competencies implicated by these tasks, in turn, presuppose more elementary ones such as detecting and monitoring differences in size or length, and so on. Though such developmental sequences can be demonstrated empirically by appropriate methods, such as scalogram analysis (Siegler, 1981; Strauss & Ephron-Wertheim, 1986), they obviously do not reflect simple empirical or causal contingencies but follow from the formal characteristics of the particular tasks (see also Smedslund, 1984).

Constructive and Conventional Implications

Actions often involve the competent use of mediating objects; particular skills (e.g., skiing, piano playing) are inherently tied to the competent use of instruments, tools, or other cultural artifacts. Efficient action here presupposes accommodation to the particular constructional features and demands of these mediating means (Kaminski, 1982; Leont'ev, 1978; Oerter, 1991). These structural features often impose strong constraints on the ordering of steps in the acquisitional sequence (e.g., Resnick, 1973). For example, children will not be able to read the hands of a clock and tell the time unless they have acquired other component skills such as distinguishing between big and little hands, translating the positions of the hands into particular numerical relations, and so forth. Though there is no one-to-one relation between structural features of an object or instrument and the developmental steps that lead to its competent use (Fischer, 1980), we can safely assume that in the ontogenetic sequence, a complex skill will not emerge earlier than the constituent skills related to the specific structural features and demands of the objects and instruments involved.

It appears that these arguments apply to all activities that are defined by specific production rules. Actions such as making a promise, dancing a waltz, or cooking spaghetti bolognese imply a recurrent configuration of actional and contextual elements, which is encoded in constitutive rules, prescriptions, or recipes. There may be variants, creative modifications, as well as atypical and less-then-successful realizations of the constitutive rules. Categories may be fuzzy, so that there may even be no criterial feature that would be common to all possible instantiations (Rosch, 1977). In cases like the ones considered earlier, however, we can identify structural features that must invariantly be present because they constitute the act in question: A waltz can only be performed in ¾ time, a promise can only be given by a person who understands the concept of obligation, and so forth. By excluding some ontogenetic sequences as structurally impossible, these structural implications also determine ontogenetic invariances.

Conceptual Implications

The meaning of the terms that we use in describing, and communicating about, behavioral or developmental phenomena essentially results from their position in a conceptual network. The semantic relations constituting such a network may be conceived of as a system of rules that determine which terms or attributes are "copredicable" (Keil, 1979). The concept of "lie," for example, is semantically related to "truth" and "intention"; when we accuse someone of a lie, we mean that he or she has purposely told an untruth. As Piaget (1932) observed, young children often use the word "lie" in a vague manner to refer to naughty words; during the course of language acquisition, the use of the word gradually becomes restricted to untrue statements made with deceitful intent, thus conforming with established conceptual rules. These rules imply that one cannot possibly identify a "lie" before having grasped the concepts of truth and intention, and that one will not be able to perform an act of lying before being able to discriminate between true and untrue and act intentionally.

Invariant ontogenetic sequences such as postulated in cognitive-developmental models of moral judgment likewise can be reconstructed as structural implications. Moral judgments essentially involve ascriptions of guilt and responsibility (Kohlberg, 1976; Turiel & Davidson, 1986); according to conceptual rules that relate responsibility to intentionality, ascribing responsibility, in turn, implies consideration of the actor's motives, intentions, and constraints. From such analyses, we may derive that competent moral judgment ontogenetically presupposes a capability to assess the motives and intentions of other persons; this also corresponds to theoretical postulates about the "necessity but insufficiency" of social-cognitive competence for competent moral judgment (e.g., Selman & Damon, 1975). It is doubtful, however, that we are dealing here with a proposition that is open to empirical refutation; rather, it seems that the falsifying case (moral competence without social-cognitive competence) is conceptually incoherent and cannot occur—given a conceptually valid assessment of moral competence. Another constitutive feature of moral competence is the ability to evaluate prevalent social norms and institutions with respect to general ethical standards.

This assumption is captured in the postulate that principled or postconventional moral judgment presupposes the development of a sociomoral perspective that is system-transcending or "prior to society" (e.g., Kohlberg, 1976). For basic conceptual reasons again, it is difficult to conceive of an ontogenetic pattern that would not conform with this assumption because ethical principles formally implicate a universal, system-transcendent stance.

These examples give an impression of how the structure of language games influences ontogenetic forms. This influence is, of course, particularly obvious in the domain of language acquisition: Through learning and instruction, communicative behavior is gradually brought into forms that conform to the established semiotic order. This constructive process is reflected in what Keil and Batterman (1984; see also Keil, 1989) have described as the "characteristic-to-defining" shift: When using a concept, children initially focus on salient features that, by way of statistical association, characterize typical instantiations of the concept (e.g., for the young child, "mother" may be strongly linked to the feature of "making supper"; see Inhelder & Piaget, 1964). As language development proceeds, the child increasingly heeds to structural invariants that structurally define the concept (e.g., "mother" as defined by a specific kinship relation), and so eventually becomes capable of correctly categorizing atypical examples that do not exhibit the expected characteristic features, as well as invalid cases that do so, but lack the defining features.

Conceptual structures do not only shape language development, as the given examples might perhaps suggest. Rather, they impose constraints on ontogenetic patterns wherever developmental phenomena are produced, defined, or assessed with reference to conceptual categories. To briefly illustrate this point, I consider some examples from the domain of emotional development. Emotion terms are embedded in, and derive their meaning from, a network of other mental concepts that we use when describing and explaining actions. For instance, "envy" is conceptually related to a process of social comparison; "jealousy" implies the perception of a particular social constellation; "worry" or "fear" imply the anticipation of aversive events, as well as doubts concerning one's ability to avert these events; "pride" points to the perception of a personal success, and so on (Brandtstädter, 1987; Mees, 1991). In the guise of causal hypotheses, relationships of this kind have also been proposed in attributional theories of emotion (e.g., Weiner, 1982). However, for a relationship to qualify as a causal contingency, the effect must be verifiable independently of the cause. Whether the cases considered can meet this formal requirement has to be questioned. If we were to ascribe feelings of, for example, envy to someone, while denying at the same time that he or she experiences the criterial cognitions constituting that emotion, this would not be a conceivable observation but rather a case of conceptual confusion. Here again, the conceptual structures define a developmental order: If a particular emotion implies a criterial or defining cognition, it will also ontogenetically presuppose the development of the corresponding cognitive competencies. Such structurally implied sequences of emotional development also emerge in empirical studies (cf. Averill, 1980; Brandtstädter, 1987; Frijda, 1986; Reisenzein & Schönpflug, 1992); however, this does not convert a structural implication into an empirical conjecture but rather attests to the conceptual validity of the empirical procedures employed.

It is important to note that unlike causal structures, semiotic structures or rules have no inherent formative force; their effect on development is mediated by individual and collective action. The processes of socialization or intentional self-development largely aim at bringing individual behavior and development into a form that justifies the application of certain concepts; concepts, for example, that denote competencies, developmental tasks, or positively valued traits. Furthermore, implicative structures that (in the mediated way specified earlier) form development are themselves the product of formative processes (Piaget, 1970; Wartofsky, 1971). Semiotic structures, unless fixed by terminological dictates, are not invariant; they accommodate to changes in socially shared beliefs and values, so that successive modifications of a concept may eventually be connected only by a loose relationship of family resemblance (Putnam, 1975; Rosch, 1978). The same is true for norms, institutions, or conventions and other structures that generate regular and recurrent developmental forms.

How can we look for invariance and universality on such unstable grounds? Although we can imagine cultures or historical periods in which particular language games and rules simply do not exist, it is likewise true that developmental constructs have no independent existence outside the semiotic and institutional structures that constitute them first and foremost. Developmental patterns that are constructed and defined in a given lan-

guage game necessarily follow the rules of that game; these games may change, but "When language games change then there is a change in concepts, and with the concepts the meanings of the words change" (Wittgenstein, 1969, p. 65).

To summarize, it appears that an action-theoretical perspective affords an improved understanding of both diversity as well as invariance in development. In defending this view, I have posited that the range within which developmental processes may vary and be modified is broad, but not unlimited. It is limited by constraints that may change across cultures and epochs (e.g., normative, theoretical, and technological constraints), as well as by constraints that, by definition, are not bound to particular contexts (such as physical laws and logical principles). Constancy and invariance in development often result from commonalities in the ways in which ontogenetic processes are canalized through personal and collective action. We have furthermore tried to show how a stronger concept of developmental universality that goes beyond mere empirical regularity might be derived from a consideration of the formal, conventional, or material structures that are constitutive of particular developmental phenomena. The common claim that the search for universality is antithetical to an understanding of development and diversity in historical and cultural contexts thus appears questionable. An actional perspective on development can apparently encompass both heuristic stances.

INTENTIONAL SELF-DEVELOPMENT AND PERSONAL CONTROL OVER DEVELOPMENT

The idea that individuals are producers or at least coproducers of their own development is not novel. Interactionist, contextualist, and organismic-structuralist approaches have embraced this notion and thus have contributed to discrediting lopsided views that portray the developing subject as being only the passive recipient of formative influences (cf. Bronfenbrenner, 1979; Lerner, 1982; Magnusson, 1990; Reese & Overton, 1970; Sameroff, 1975). These approaches, however—and the organismic models in particular—have primarily conceived of development as the result of person-environment transactions rather than as a target area of intentional action; in other words, the relation between action and development has been conceptualized primarily as a functional rather than an intentional one. This focus seems appropriate for early phases of development: The infant certainly does not engage in interactions with the social or material environment with the intention of promoting his or her development. Even if at very early developmental stages the child's activity shows signs of intentionality, it is not intentionally directed toward some developmental task or goal. Such intentional orientations generally come into play indirectly through other agents, primarily through the caregivers who organize and constrain the child's space of action according to intended developmental agenda, and who thereby shape and canalize the child's further development in co-constructive interaction with the child him- or herself, as well as with the cultural macrosystem (Goodnow & Collins, 1990; Lerner, 1985; Valsiner, 1988c; Wozniak, 1993).

It is during the transition to adolescence and early adulthood that the individual's conceptions of self and personal future become articulate enough to guide intentional activity. External directives and demands originating in the familial and larger social context become increasingly internalized and integrated into processes of self-regulation and self-evaluation; with the progression from a heteronomous, external mode of developmental control to an increasingly intentional and autonomous mode of intentional self-development, a new and higher level in the regulation of ontogeny is reached. This reflexive-intentional mode has been given rather short shrift in developmental research; however, for an actional perspective, it is of focal interest.

In elaborating this point, it will be necessary to heed the reciprocal character of the action-development relationship: Activities of intentional self-development are themselves developmental outcomes, they change over the life cycle in structure and intentional content. In the following, I first try to elucidate the basic process features of such activities. Based on these analyses, I focus more closely on the ontogeny of self-regulatory activities as well as on modifications and changes in these activities across the life span.

Activities of Intentional Self-Development: Structure and Process

Self-regulative activities in contexts of intentional self-development comprise different functional components. Models of self-regulation differentiate mostly between

the following phases or component processes (Bandura, 1986; Carver & Scheier, 1981, 1986; Kanfer & Hagerman, 1981; Karoly, 1993; Schunk, 1991): (a) *processes of self-observation and self-evaluation,* in which the convergence of an actual with a desired situation or course of events is monitored; (b) *predecisional or preparatory processes,* which involve the weighing of alternative options, the specification of goals, and the elaboration of plans for goal implementation; (c) *executive processes* (when goal-directed behavior has to be maintained over longer periods, the executive phase may engage auxiliary processes to buffer implementational intentions against distractive influences and to compensate for the relative absence of external supports); and (d) *evaluative processes,* in which the efficiency of actions is assessed with respect to intended outcomes, and which also serve to gauge self-views of competence and efficacy.

The various phases or levels of action regulation are partly intertwined and often cannot be separated cleanly. In complex, nonroutine tasks, preparatory and executive phases may comprise intermediate action cycles that each involves the whole range of processes distinguished earlier. It has to be emphasized that the transformation of intention into action is not generally a smooth or automatic process; rather, difficulties may occur in the transition between the different phases or levels of action regulation. Such problems deserve particular attention because they often give rise to feelings of helplessness and depression (Kuhl & Beckmann, 1985).

Figure 10.3 (see also Brandtstädter, 1992, 2001) summarizes these considerations and translates them into the realm of development-related action; the figure also serves as an orienting framework for the further discussion.

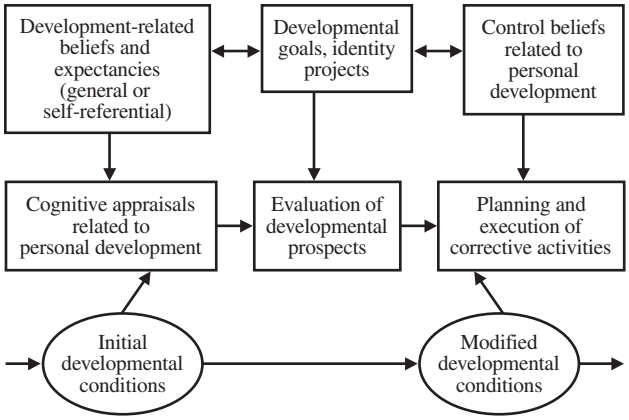

Development-related beliefs and expectancies (general or self-referential)
Developmental goals, identity projects
Control beliefs related to personal development
Cognitive appraisals related to personal development
Evaluation of developmental prospects
Planning and execution of corrective activities
Initial developmental conditions
Modified developmental conditions

Figure 10.3 Personal control of development: Component processes and constraints.

In Figure 10.3, the connection of self-observational and self-corrective phases resembles a feedback loop. In the typical negative-feedback loop, observed deviations from a preset standard activate corrective measures designed to counteract the discrepancy (for action-theoretical applications of the feedback loop concept, see, e.g., Carver & Scheier, 1981, 1998; G. A. Miller et al., 1960). However, some caveats have to be added. First, it should be clear that activities of intentional self-development may be induced not only by currently perceived but as well by anticipated discrepancies from a desired developmental course or outcome. More important, activities of intentional self-development may involve not only discrepancy reduction but also discrepancy production, as is the case when persons set themselves new and more ambitious goals. Such self-generated discrepancies are not frustrating, but rather provide positive motivation and a sense of meaning in life (Bandura, 1989, 1991). The positive emotional quality of internally induced, as compared to externally produced, goal discrepancies is presumably related to differences in perceived control; generally, individuals only select new goals that they consider to be attainable. Finally, negative-feedback models of self-regulatory behavior do not provide for the important fact that discrepancies between actual and desired situations can be reduced not only by changing the situation in accordance with goals but also, conversely, by adjusting goals and conditions to situational circumstances—for example, through rescaling self-evaluative standards or downgrading ambitions (Brandtstädter & Renner, 1990; Carver & Scheier, 2003; Elster, 1983; Klinger, 1975, 1987). As discussed later, this adjustment of preferences is fundamental to understanding changes in themes and goals of intentional development across the life cycle.

Self-Observation and Self-Monitoring in Intentional Self-Development

In self-observation and self-monitoring, bottom-up or data-driven processes are interlinked with top-down or concept-driven processes. In order to assess, for example, whether some attribute denoting a certain skill or competence applies to oneself, one has to scrutinize behavioral episodes and pertinent representations in episodic memory to ascertain whether they sufficiently match the indicator pattern of the particular attribute;

this process is directed and constrained by conceptual rules that are stored in semantic memory and are activated during the process of self-observation (cf. Berzonsky, 1988; Medin & Smith, 1984).

Through elaborating the meaning and implications of observational data, a semantic link or correspondence with self-concept representations is construed, given that goals and self-evaluative standards also are sufficiently elaborated. Self-evaluative processes will not be activated unless such a correspondence is established. To be compared in an evaluative contrast, goals and observations must be represented on a similar level of specification; this hints at a potential trouble spot in self-regulatory processes.

Processes of self-monitoring can differ inter- and intraindividually with respect to their differentiation, thematic focus, and accuracy. These qualities depend on cognitive resources and motivational dispositions, which, in turn, can change over the life cycle.

Complexity and Differentiation

The more explicit and detailed the monitoring process, the more precise the timing and targeting of corrective interventions can be. For example, weight control is more effective when changes in weight and related parameters such as calorie intake are monitored closely and regularly (Bandura, 1982b; Mace, Belfiore, & Shea, 1989; Schunk, 1991). Explicitness and differentiation of self-observation depend on person-specific and situational factors. Of great importance is the complexity and richness of the individual's knowledge base, which itself is dependent on personal and biographical conditions such as cognitive capacity and expertise (Sternberg & Wagner, 1986). The quality of self-observation also depends on personal interests and motivations because areas of personal importance are generally monitored more intensively and carefully than those of less relevance. In cases in which self-referential feedback has threatening or self-depreciating implications, however, defensive processes may be activated that inhibit a careful scrutiny of information (e.g., Kruglanski, 1990); I discuss this more closely in later sections.

Attentional Focus

Self-observation involves self-focused attention. The readiness to make oneself (and one's self) the target of attentive observation differs between individuals and situations; dispositional differences are addressed by constructs such as "self-awareness" (Duval & Wicklund, 1972), "self-consciousness" (Fenigstein, Scheier, & Buss, 1975), or "self-monitoring" (M. Snyder, 1979). A state of self-attentiveness is likely to occur in situations of high personal concern that have implications for the public or private construal of the agent's self, and in which no routinized pattern of action is readily available (Karoly, 1993). Generally, attention is centered on those elements in an action sequence that lack a safe orientational basis so that additional information has to be gathered or generated to prepare the next steps (Allport, 1987; Carver & Scheier, 1986, 1990; Parasuraman & Davies, 1984).

The regulation of attention engages automatic as well as strategic-intentional processes (Shiffrin & Dumais, 1981; Shiffrin & Schneider, 1977); as an intentional strategy, self-focused attention may serve purposes of self-cultivation, self-management, or self-presention, and may enhance a flexible adjustment to changing social situations (Bandura, 1986; M. Snyder & Campbell, 1982; Tesser, 1986). In biographical contexts, self-focused attention is intensified when a person is faced with disruptive changes or critical developmental transitions that necessitate a readjustment of personal goals, projects, and behavioral routines: Self-attentive and self-corrective tendencies are generally more pronounced among people who are dissatisfied with themselves and their developmental prospects (Brandtstädter, 1989). Self-critical reflection involves a temporary dissociation of the self into a criticizing and a criticized part, a condition that—since Aristotle (see Arendt, 1976)—has often been considered as pathological or pathogenic (e.g., Ellis, 1976). However, it seems more appropriate to consider self-attention not as the cause but rather as a symptom of an adaptive problem, or, more precisely, as a functional component in processes of coping and readjustment.

In a broader sense, self-attention may involve all external conditions that are relevant for personal goals and projects. Phases in the life course in which demands from different and potentially conflicting roles and tasks coincide may involve a particularly high attentional load; in everyday contexts, different goals and courses of action are often pursued simultaneously. The strain that results from simultaneously attending to different goals and tasks can be reduced by a decomposition and sequential arrangement of tasks. Thus, for example, the diversity of adaptive problems that characterizes physical and social development in adolescence is reduced to a manageable format by addressing the

problems sequentially and focusing on only one issue at a time (Coleman, 1980). A decomposition of multiple tasks through sequential focusing is to some extent automatically effected in the process of attention deployment itself (Dörner, 1984). Generally, attention centers on those contents and themes that constitute a person's "current concerns" (Klinger, 1987); with a change in life themes and identity projects, the focus of attention shifts accordingly, even if the individual is not explicitly aware of such changes (Csikszentmihalyi & Beattie, 1979; Erikson, 1959).

Protective and Defensive Mechanisms

Like other perceptual processes, but even more so, the process of representing ourselves is tinged by personal motives, needs, and subjective theories. The processing of self-referential information in particular is subject to constraints that serve to maintain as far as possible the integrity and continuity of the self-theories that we have devised and consolidated over the course of our lives, and that guide us in organizing our future development (Greenwald, 1980). Observations are generally open to multiple interpretations; from alternative explanatory and interpretative options, those will be preferred most readily that fit best with the person's actual motives and beliefs. Individuals tend to doubt the validity of data that are discrepant to prior beliefs; in extreme cases, a rejection or blatant denial of evidence may occur (Festinger, 1957; Nisbett & Ross, 1980; Wicklund & Brehm, 1976). Certainly, the perceptual system is primarily tuned to evaluating, rather than to preserving, the actor's beliefs. But even if evidence is strong enough to enforce a change in the subject's system of prior beliefs, these changes will obey a principle of conservatism that Quine (1951, p. 41), with regard to the dynamics of scientific theories, has put as follows: ". . . our natural tendency is to disturb the system as little as possible." A theoretical proposition can, at least in principle, always be defended against discrepant evidence by making adjustments elsewhere in the theoretical system, and the same is true for the hypotheses that people hold about themselves.

Apart from the consistency effects mentioned earlier, established self-referential beliefs are backed by tendencies of self-verification and self-enhancement. Evidence will generally be negotiated in ways that have positive implications for a self-concept and a personal view of the world, and self-enhancing interpretations will generally be more readily accessible than self-denigrating ones (Kunda, 1990; Steele, 1988; Swann, 1983). Mechanisms of self-enhancement and cognitive consistency generally merge in the processing of self-referential information (C. R. Snyder & Higgins, 1988). However, both tendencies can conflict; for example, self-deprecating or threatening evidence may be so strong that negating it would violate other strong beliefs. There is some evidence that, in such cases, consistency principles dominate over tendencies of self-enhancement (Swann, Griffin, Predmore, & Gaines, 1987).

Concepts such as "self-serving bias," "denial," or "defense" connote a violation of rationality principles; the influence of self-protective mechanisms in information processing seems opposed to a "realistic" self-view, which has been traditionally considered to be a basic requirement of mental health and optimal development. However, even within the limits of rationality, there is generally broad scope to handle evidence in self-serving ways so that the functionality of such mechanisms must be assessed more cautiously (S. E. Taylor, 1989). From a developmental perspective, the potential adaptive value of self-protective mechanisms becomes particularly apparent. For example, as people age, the self-scheme formed in earlier phases of life is threatened by experiences of loss in various functional and social domains; protective and defensive mechanisms help to preserve self-esteem and personal continuity when individuals confront aversive and irreversible developmental changes. Though they operate largely on a nonintentional level, such mechanisms affect activities of intentional self-development in various ways. By dampening perceptions of loss and identity deficits, protective mechanisms may inhibit self-corrective tendencies, but they also serve to arrange priorities for self-corrective intervention and to canalize self-regulatory resources into domains that are amenable to change (Brandtstädter & Greve, 1994; Brandtstädter & Rothermund, 2002a).

Processes of Self-Evaluation

Self-evaluative reactions mediate between self-observation and self-regulative action. In the process of self-evaluation, the actual self-perceptions are contrasted with representations of desired self-aspects as manifested in the individual's goals, ambitions, moral orientations, and identity projects (Higgins, Strauman, & Klein, 1986). As mentioned earlier, both self-evaluative standards and observational data have to be represented on an appropriate level of specification for such an evaluative contrast.

During goal implementation, the focus of self-evaluation may shift to temporal, qualitative, or quantitative modalities of goal attainment (to reach a career goal in a certain biographical span, to maintain a given rate of progress toward a goal, and so forth). Such implementational standards are formed in the transition from intention to action, and they are to some extent necessary for such a transition to occur. When implementational standards become salient as reference points for self-evaluation, a new level of "metamonitoring" (Carver & Scheier, 1986) is established, which is reflected, for example, by the fact that emotions such as disappointment, pride, or shame are no longer determined by the perceived discrepancy or distance from the goal as such, but rather by the perceived rate, quality, or smoothness of progress toward the goal.

Self-evaluative standards can change over the life cycle; this once more highlights the reciprocal influence between action and development. For example, with advancing age, desired features such as health, intellectual efficiency, or professional success may assume partly different meanings, and the corresponding self-evaluative standards may be raised or lowered. Changes in action resources that result from the interaction of age-graded, sociohistorical, and nonnormative factors across the life course (Baltes, Cornelius, & Nesselroade, 1979) may affect the difficulty and, accordingly, the personal costs of realizing certain goals or maintaining certain standards. Shifts in personal goals and standards over the life course may also reflect implicit theories of development and normative age expectations. By defining what expectations persons of a given age should hold for themselves and their future development, normative expectations can legitimate or discredit personal goals and aspirations. Individuals differ with respect to the flexibility with which they adjust goals and standards to changed developmental prospects; as I discuss in more depth later, this accommodative flexibility plays an important role in coping with developmental losses and in securing a sense of personal continuity and efficacy over the life span (cf. Atchley, 1989; Brandtstädter & Renner, 1990; G. Brim, 1992).

Activation and Inhibition of Self-Evaluative Reactions

Self-evaluative reactions depend on how individuals construe the meanings and effects of their actions. It follows that self-evaluative processes, and the ensuing action tendencies, can be enhanced or weakened through destruction or alteration of such meanings and implications. Self-corrective tendencies may be dampened by minimizing or downplaying negative implications of personal conduct or by balancing them against presumed positive effects; the beliefs, theories, or symbol systems that generate negative implications may be doubted or discredited; when the individual's behavior or development deviates from social norms, ascriptions of responsibility, self-reproaches, or feelings of guilt may be neutralized by construing the event as uncontrollable or by portraying it as morally legitimate (Bandura, 1989; C. R. Snyder & Higgins, 1988). Self-evaluation is also crucially affected by chosen comparison standards. For example, when evaluating their health or physical capacities, elderly people typically compare themselves to peers rather than to younger persons (or to themselves at a younger age); in this way, the salience of losses or functional impairments is reduced, and stability of self-descriptions—in the sense of positional stability within a reference group—can be maintained (Brandtstädter & Greve, 1994; J. Heckhausen & Krueger, 1993).

From an action point of view, however, the self-enhancing effects of "downward" comparisons must be balanced against their potential effect of dampening self-corrective intentions. In contrast, "upward" comparisons, such as comparisons with admired ideals or competitors of superior competence, may induce a negative self-evaluation, but they can also provide motivating goals for self-development, at least as long as the individual is confident of having the action resources and developmental reserves necessary for realizing these goals (e.g., Collins, 1996; Wills, 1991).

The cognitive and symbolic processes through which self-evaluations are engaged or disengaged are important targets in self-management; for example, mental simulation of positive or aversive outcomes can be an effective means to spur self-corrective tendencies and to maintain a given course of action against obstacles and temptations (C. Taylor & Schneider, 1989). It would be a mistake, however, to view the earlier-mentioned processes simply as intentional or strategic behaviors that may be activated at will. Rather, such processes basically hinge on the availability and personal accessibility of pertinent information. For example, biographical experiences determine which episodes are available as reference standards for evaluating actual developmental options, and thus can significantly influence the setting of aspiration levels and the individual's readiness to accept the situation (Strack, Schwarz, Chassein, Kern, & Wagner, 1990). Contrast effects of this nature might possibly account for the well-documented fact that older persons, who mostly have suffered wars and economic

crises, seem to be less vulnerable to depression than younger generations (Blazer, 1989; Seligman, 1990). Existential attitudes such as religious beliefs or a belief in a just world likewise can influence the accessibility of specific interpretations; for example, in coping with losses, such attitudes may enhance or impede the construction of palliative meanings, depending on responsibility attributions (Montada, 1992).

Developmental ecologies, in general, may differ as to the particular meanings and comparative standards they afford. Cultural and historical influences, as well as factors related to a person's position in the life cycle, shape and constrain the informational and symbolic space in which processes of self-evaluation operate. Social systems institutionalize conceptions of desirable development, and they tend to stabilize such conceptions through contriving legitimating stories and providing arguments and symbols that support them (Dannefer & Perlmutter, 1990). Furthermore, normative expectations and stereotypes about development and aging provide the backdrop against which views are negotiated as to what should be considered as normal, reasonable, or appropriate for individuals of a given age. It is obvious that such informational and symbolic constraints have a normative and directive influence on processes of intentional self-development.

Emotions in Self-Evaluation

The process of self-evaluation can activate a broad spectrum of positive or aversive emotions. An individual might look back on his or her life course with feelings of pride, anger, or gratitude, and future developmental prospects may evoke hope and confidence, or perhaps fear, worry, or despondency. When developmental prospects are ambiguous or polyvalent, a mixture of such feelings often occurs.

Emotions are linked to, and mediate between, cognitions and action tendencies (e.g., Averill, 1980). In contexts of intentional self-development, emotions signaling a mismatch between intended and actual developmental outcomes are of particular interest because of their inherent potential to enhance corrective action. Examples to consider include affective reactions of guilt, anger, and worry: As a future-oriented emotion involving the expectation of aversive events, *worry* typically engages preventive tendencies, and motivates efforts to acquire knowledge and skills that are deemed instrumental for coping with the aversive event. Feelings of *guilt* or *remorse* involve a belief of having violated specific norms, normative expectations, or moral principles; such emotional states may engage tendencies of self-punishment, recompensation, or activities to stabilize threatened self-definitions through "symbolic self-completion" (Gollwitzer, Bayer, Scherer, & Seifert, 1999; Wicklund & Gollwitzer, 1982). Feelings of *anger* indicate an obstruction of personal goals; they typically involve a proclivity toward destroying the frustrating obstacles. Reactions of anger are particularly strong when positive contrasts are readily accessible (Kahneman & D. T. Miller, 1986; D. T. Miller, Turnbull, & McFarland, 1990). These examples should not be taken to imply that self-referential emotions are important only in self-regulation. Empathetic reactions of pity or sympathy, or feelings of awe or disdain that may be evoked by observing the conduct of other persons, can likewise affect intentional self-development through making salient facets of identity and morality (e.g., C. Taylor, 1989).

Through further analysis and cognitive elaboration of a perceived situation, emotional appraisals as well as the corresponding self-regulatory tendencies may be modified in intensity and quality (Lazarus & Smith, 1988; Parkinson & Manstead, 1992). Depending on how the person, upon further analysis, appraises the implications of a threatening situation as well as his or her capabilities of handling them, feelings of anger or worry may be converted into hope or happiness or either into emotional states of hopelessness and despair. When negative events such as developmental losses or impairments are perceived as global and irreversible, feelings of sadness and hopelessness are the typical result. Such feelings may arise, for example, in later life when the individual realizes that personally important projects cannot be achieved in the remaining lifetime. Feelings of hopelessness may eventually be transformed into more chronic states of depression when goals and ambitions that have drifted outside the feasible range are maintained tenaciously. Depressive reactions are often characterized by a feeling of not being able to be or become the person that one would like to be; such reactions may mark crises as well as turning points in personal development. Often, states of depression can be terminated only by disengaging from barren commitments and turning to new goals; feelings of helplessness may even spur processes of disengagement and reorientation (Brandtstädter & Rothermund, 2002b; Carver & Scheier, 1998; Klinger, 1987).

From Goals to Action: Definition and Implementation of Developmental Goals

When people are asked to report the goals they pursue for their future, answers typically differ in abstractness

and globality. The scope of goal perspectives can range from highly abstract ideals (e.g., to actualize personal potentials, strive for professional competence, fight for peace and justice) to very concrete tasks and day-to-day projects (e.g., visiting a friend or running an errand). Such differences may be related to person-specific factors like value orientations or the range of future perspectives; in later life, the fading of time-yet-to-be-lived may reduce the commitment to long-term projects (e.g., Brandtstädter & Wentura, 1994; Kastenbaum, 1982). Goals on different levels of temporal extension and generality are often pursued simultaneously so that concrete, short-term projects often serve more long-term or abstract purposes. The hierarchical organization of actions and action plans is reflected in the fact that questions about personal motives or reasons for a given activity ("why"?) typically prompt accounts in terms of higher level goals, whereas questions concerning the ways in which a particular activity is carried out ("how"?) tend to evoke low-level, instrumental goals (Kruglanski, 1996; Martin & Tesser, 1989). Differences in the "phrasing level" of goals (Little, 1989), however, may also point to the level of regulation in the transition from goal definition to implementation on which the individual's attention is actually centered (cf. Pennebaker, 1989; Vallacher & Wegner, 1987). Attention centers, preferably, on goals, plans, or steps within an action sequence that pose implementational problems. Pondering about basic personal goals and life themes is increased in situations of crisis and conflict: This converges with findings pointing to an association between depression and a predominant concern with high-level strivings (Emmons, 1992).

Developmental research has traditionally addressed life themes and developmental goals from a very global perspective only; the emphasis was on establishing a general pattern or sequence of basic motivational concerns during the life cycle. For example, Charlotte Bühler (1933; see also Bühler & Marschak, 1969) has posited five basic life tendencies ("need satisfaction," "adaptive self-limitation," "creative expansion," "establishment of inner order," "self-fulfillment"), which she assumed to govern behavior and personal development in different phases of the life cycle from early childhood to late adulthood. Elaborating Bühler's model, Erikson (1959) has portrayed eight stages of identity development across the life cycle, each with its salient psychosocial crisis and task (e.g., the dominant issues of adolescence and of middle and later adulthood were grouped under the labels of "identity," "generativity," and "ego integrity," respectively). In his model of developmental tasks, Havighurst (1948/1974) has made a similar attempt to define a basic pattern of priorities for self-development across the life span, which he thought to reflect the joint influence of biological changes and of age-graded cultural demands. These concepts undoubtedly had a seminal influence in developmental research, but they give short shrift to the variegation of developmental goals in content, complexity, and abstraction and to the processes mediating the definition and implementation of goals. Recent approaches in personality and action research provide a more differentiated treatment of these issues; for example, the concepts of "personal strivings" (Emmons, 1986, 1989, 1992), "personal projects" (Little, 1983, 1998), "life themes" (Csikszentmihalyi & Beattie, 1979; Schank & Abelson, 1977), or "life tasks" (Cantor & Fleeson, 1991; Zirkel & Cantor, 1990) are formulated with explicit reference to the regulative role of goals in personal development (see also Brunstein, Schultheiss, & Maier, 1999).

Goals of intentional self-development are reflected in the plans, projects, and courses of action into which the individual invests time and effort. Only rarely, however, are developmental goals represented from the outset in a format that already specifies the means and procedures necessary for goal attainment. Sociocultural developmental tasks (Havighurst, 1948/1974), too, are usually framed with a degree of abstraction that allows the implementation to be tailored to personal and situational circumstances. The implementation of goals basically depends on three types of constraints: (1) how the goal in question is interpreted, (2) which means are deemed necessary for goal attainment, and (3) whether the relevant means and resources are available on social and personal levels. In the following, I take a closer look at the translation of goals into intentions and of intentions into actions.

Levels of Regulation: Control-System Accounts

According to control-system accounts of action, the process of transforming goals into actions involves a hierarchy of feedback loops; goals on a superordinate level of regulation are converted successively into more specific plans or programs, and further into concrete behavioral sequences (cf. Carver & Scheier, 1986, 1998; Powers, 1973). Thus, for example, the abstract principle of "being helpful" may, depending on situational circumstances, activate specific programs such as "helping an elderly person to cross the street," which are then further specified and translated into behavioral sequences.

This top-down process is also constrained by perceptual input to generate situationally appropriate specifications. Within the hierarchy, the progression from lower to higher levels of regulation is mediated by subroutines such as cognitive scripts or production systems; each level sets subgoals or reference values against which activities on the next lower level are monitored.

Activities of intentional self-development may be easily analyzed in similar terms. The most abstract and general life themes and identity projects would then be represented on a superordinate level of regulation, and would be successively specified and transformed on subsequent levels into situationally appropriate plans and behaviors, as outlined earlier. The heuristic advantages of such hierarchical, top-down concepts of action control are obvious. Perhaps most important, the transition from goals to actions is portrayed as a creative, nondeductive process. For habitualized action patterns, this transition may be partly or fully automatized; in nonroutine situations, however, knowledge structures and heuristic procedures have to be activated to specify and implement goals and intentions. Accordingly, the hierarchic-sequential model also offers vantage points for analyzing disorders in action regulation; obviously, the functional interplay between levels of regulation may be affected if the actor's knowledge, competencies, or skills do not suffice to link abstract goals with concrete meanings, plans, and procedures.

However, it is necessary to add some reservations to this picture. As already mentioned, any plan or behavior may serve different goals simultaneously. Hierarchic-sequential models have notorious difficulties in accounting for the polyvalence of actions and for the conflicts and compromises that may result from it in the definition and execution of goals. Moreover, it often appears to us only in hindsight how our actions relate to superordinate goals and principles; in the ontogenetic sequence, too, the acquisition of certain action patterns can precede an understanding of their meaning and relevance. The most important objection, however, is that the streamlined format of hierarchic-sequential models gives a biased or inadequate picture of acting and planning in complex situations, in which priorities are often rearranged ad hoc, plans are concretized or revised during implementation, and goals may change in an overtly unsystematic and opportunistic manner. Such "planning in action" (Meyer & Rebok, 1985) is particularly characteristic for global, long-term, or vaguely defined goals. Due to its adaptive flexibility, such "muddling through" may be the most reasonable strategy (if it is one) in situations fraught with uncertainty and complexity (Popper, 1961). Under such conditions, planning activities tend to exhibit an incremental, improvised quality rather than a linear, top-down format (Hayes-Roth & Hayes-Roth, 1979); planning about life is perhaps the prototypical case.

These reservations call for a more fine-grained analysis of the processes of goal definition and implementation in intentional self-development. In the following, I first address the semantic and procedural specification of goals, and then turn to issues related to the enactment and maintenance of self-regulatory intentions.

Goal Definition: Semantic and Procedural Specification

To serve as guidelines for intentional self-development, goals have to be specified with respect to their semantic implications, that is, as to their meanings and criteria, as well as with respect to procedural implications related to their implementation. It seems important to distinguish carefully between these two dimensions of the goal definition process because they generally involve different types of knowledge and heuristic procedures. The connection of semantic and procedural specifications of a given goal may be denoted as a *plan* (Friedman, Scholnick, & Cocking, 1987; Nuttin, 1984; J. Smith, 1996, 1999).

Whether we consider professional career goals, goals related to codevelopment in partnerships, or maintenance goals concerning the preservation of physical or mental competencies in later life, the formation of more concrete implementation intentions always requires the unfolding of the semantic implications of the given goal, that is, an explicit representation of criteria or prototypical features that define the intended outcomes. These interpretations may be available already in semantic memory; otherwise, they have to be construed through mediating heuristic activities. Social scripts and institutionalized definitions may aid and direct this interpretative process. Through semantic elaboration, goals are linked with a "recognizer pattern" (Schank & Abelson, 1977) of more explicit indicators, which guides the processing of information in the execution and evaluation of goal-related activities and which, in particular, facilitates retrieval of relevant procedural knowledge from long-term memory (S. E. Taylor & Crocker, 1981).

Semantic specification of goals, however, is not sufficient for regulating goal-related action; representations of intended goal states have to be fleshed out by linking

them to representations of the conditions and activities that are relevant for attaining a given intended state. Such operative links cannot be formed unless the pertinent procedural information is contextually available and cognitively accessible to the actor. When different and equally effective options for accomplishing a goal are available, actors will generally prefer the one that seems to afford the most favorable balance of desirable and undesirable side effects. For example, in accomplishing some career goal, individuals choose an option that appears most compatible with other personal goals and identity projects (such as personal principles of fairness, health-related or family related interests, and so forth). This highlights the important point that the specification and selection of goals for personal development is subject to optimality principles that take into account the whole system of personal goals and projects, or at least parts of it which are eventually affected by a given procedure of goal attainment. As a consequence, the procedural specification of goals often involves compromises that may be suboptimal with respect to the given goal, but promise a greater utility with respect to the more comprehensive array of personal interests. This more comprehensive perspective may even embrace the needs and interests of other persons. In contexts of marital co-development, for example, the life ambitions and developmental goals of partners often have to be mutually adjusted to preserve a stable and satisfying relationship (Brandtstädter et al., 1986; Ickes, 1985). The degree to which an egocentric stance in the choice and procedural specification of goals is transcended also reflects the actor's sociomoral perspective; moral and ethical criteria have the essential function of constraining the selection and implementation of personal goals in ways that heed the interests of co-developing individuals.

Action Paths and Chronic Goals

The procedural specification of goals, and of long-term developmental goals and projects in particular, generally determines a temporal sequence of intermediate steps. The subgoals in a planned action sequence generally encompass a shorter time span than the superordinate or distal goals to which they relate (Carver & Scheier, 1981). The sequential structure of plans is also important from a motivational point of view; through reducing the complexity of the task, it enhances perceived control over the actional sequence and affords proximal reinforcements that contribute to the maintenance of intentions over longer periods (Bandura, 1986; Harackiewicz & Sansone, 1991; Pervin, 1991).

Sequences of action steps or subgoals that are instrumentally related to a common overarching life theme or goal form what may be called an "action path" (Raynor, 1981). The individual's self-view and future perspective critically hinge on the temporal extension of and progress in action paths. The initial steps are motivated primarily through anticipation of further achievements in the path; with further advancement, retrospection on previous achievements becomes increasingly important as a source of self-evaluation. When paths are terminated by the attainment of a desired final outcome ("closed paths"; Raynor & Entin, 1982, 1983), a loss of meaning and purpose may be experienced (e.g., Baumeister, 1986). The emotional quality of personal developmental prospects thus depends crucially on how far the subject succeeds in keeping action paths open or avoiding closure through interlocking paths and creating new and meaningful commitments: "The open path . . . provides a means of understanding the difference between individuals who remain psychologically young through continued becoming and those who become psychologically old through exclusive dependence upon having been . . ." (Raynor, 1982, p. 274). Often, action paths may be extended by a motive to secure, further improve, or embellish what has been achieved (e.g., Schank & Abelson, 1977). The sequential arrangement of developmental tasks and normative social expectations across the life cycle may also facilitate a meaningful interlocking of goals and action paths. With advancing age, however, the shrinking of the temporal horizon tends to cut short and finalize action paths; accordingly, reminiscing about biographical achievements becomes increasingly important in later life as a resource of personal continuity and self-respect (Coleman, 1986).

As already mentioned, not all goals can be finally attained through a sequence of instrumental steps. Apart from the trivial fact that goals might be too difficult for the individual to achieve, some goals are chronic or persistent in the sense that they, by their very nature, cannot be reached conclusively. Goals may be rooted in enduring motivational dispositions for which no conclusive consummatory event can be defined, for example, a striving for health, social recognition, or professional success may (perhaps under continual accommodation of standards and criteria) shape and regulate intentional self-development during an entire life. Other goals may

function like general maxims or rules of conduct that we take into consideration whenever we act, decide, or make plans. For example, identity goals such as sincerity, fairness, altruism, or wisdom denote qualities of action that are manifested in, rather than achieved by, a particular conduct. In addition, competence goals such as professional expertise or artistic productivity, due to their vagueness and complexity, leave room for permanent renegotiation as to their contents and standards (e.g., Atchley, 1989). Chronic or insatiable goals of this kind essentially contribute to keeping action paths and developmental prospects open (Gollwitzer, 1987; Gollwitzer & Moskowitz, 1996; Srull & Wyer, 1986).

Enactment and Maintenance of Self-Regulative Intentions

The enactment of goals can be hampered by a variety of conditions, some of which have been addressed already. Deficits in the semantic and procedural specification of goals are one possible reason why individuals abandon action projects prematurely or fail to initiate them in the first place. In such cases, intentions remain in a rudimentary or degenerated state that may become the source of helplessness and depression (Kuhl & Beckmann, 1985), at least when the goals remain so important that individuals are unable to disengage from them.

The internal and external forces that direct and sustain action (motivational states, incentives, resources, constraints of action) are not stationary but typically change during the implementation of an action or plan. Distractions and enticements may interfere with intentions; unexpected obstacles can alter the subject's balance of costs and benefits; material and physical action resources may become exhausted prematurely. These difficulties arise particularly with long-term projects, and may be aggravated by the lack of concrete, tangible incentives and the considerable delay of gratification that such long-range goals typically involve.

To some extent, intentions are already automatically screened off against competing action tendencies. In predecisional or preparatory stages during which alternative goals and plans are considered, individuals tend to soberly weigh the pros and cons of impending decisions; in contrast, when the die is cast and the person has entered the phase of implementation, cognitions that support maintenance and execution of the plan will become more readily accessible (Gollwitzer, 1990; H. Heckhausen & Gollwitzer, 1987). Furthermore, difficulties encountered in the execution phase can lead to an increase in the attractiveness of the goal, at least as long as the obstacles appear to be surmountable (e.g., Wright & Brehm, 1989); apparently, such reactant increases in goal valence serve to mobilize action resources and to neutralize or counteract inhibiting tendencies. Ambitions of a "just manageable difficulty" (G. Brim, 1992) often are experienced as more attractive than goals requiring low effort, in particular when they are perceived as an opportunity to actualize, and to obtain feedback about, personal competencies (see also Locke & Latham, 1990).

On the other hand, to maintain intentions can itself become an objective of intentional action (Kuhl & Beckmann, 1994). Terms such as *willpower* or *self-discipline* traditionally refer to the capacity to make one's intentions and volitions the target of intentional control. Sometimes, the construct of self-regulation is used to denote just such processes of directional maintenance (e.g., Baumeister, Heatherton, & Tice, 1994; Karoly, 1993). Self-regulation in the given sense comprises a broad gamut of strategies such as stimulus control and milieu selection (e.g., eliminating distractive influences, selecting facilitative environments), attentional resource allocation (e.g., focusing on intention-enhancing aspects of the situation, disregarding interfering stimuli), or emotion and motivation control (e.g., centering on proximal goals, imagining positive consequences). Basically, all these strategies serve to keep the balance between attractive and aversive valences within margins that are necessary for continuing an intended course of action. To some extent, strategies of self-control are already acquired in early socialization (Harter, 1983; W. Mischel, 1983; W. Mischel, Cantor, & Feldman, 1996; W. Mischel & Mischel, 1976); the acquisition of such strategies sets the stage for intentional self-development. The processes of self-control are functionally tied to the medium of language; processes of self-encouragement, self-reinforcement, and self-critique presuppose the capacity of symbolically representing oneself, which forms the basis for a conceptual self (Luria, 1979).

PERSONAL CONTROL OVER DEVELOPMENT: EMERGENCE AND DEVELOPMENTAL CHANGE

The question of how the processes of intentional development themselves develop and change over the life span

leads into an area that is seriously underresearched. The ontogeny of intentional action generally has not been a focus of developmental research, although it has drawn increasing attention during the last few years (e.g., Brandtstädter, 1999; Bullock, 1991; Lewis, 1991; Oppenheimer & Valsiner, 1991; Valsiner, 1987a). Even more conspicuous is the lack of research on the genesis and change of those competencies and activities through which individuals shape and organize their own developmental history.

Development-related action presupposes particular representational capacities. The individual must have formed goals and standards for personal development, and must be able to evaluate the current situation with regard to these self-guides; furthermore, he or she must have acquired some knowledge about probable and possible courses of future development and means and strategies for attaining personally and socially desired outcomes. Moreover, specific regulatory competencies are required for enacting self-regulatory intentions and maintaining them over longer intervals. Personal concepts of actual, desired, and possible selves (i.e., representations of how and what an individual is, should be, could be, and would like to be) provide the motivational basis for such processes (Cantor, Markus, Niedenthal, & Nurius, 1986; Higgins, Klein, & Strauman, 1985); these representations also change, and are socially expected to change in particular ways, over the life cycle.

These preliminary considerations suggest that in analyzing the ontogeny of intentional self-development, three basic lines of development should be considered: (1) the development of intentional action in general and of cognitive and representational processes related to intentionality; (2) the formation of beliefs and competencies related to personal control over development; and (3) the development of the self (or self-concept) as a more or less coherent structure of self-referential values, beliefs, and standards that guides and directs self-regulatory processes.

Intentional Action: Developmental Aspects

Intentionality is intrinsically tied to the capacity to recognize regularities in behavior-outcome contingencies and to anticipate possible effects of one's own behavior (Lütkenhaus & Bullock, 1991). Neonates already show instrumental learning and exhibit some degree of contingency awareness (Olson & Sherman, 1983). However, an understanding of personal agency presupposes the epistemic separation of self and nonself that gradually evolves from the radically egocentric and syncretic mode of experience that characterizes the primordial phase of cognitive development (Kegan, 1983; Piaget, 1936/1952). It is this separation that is the developmental origin of a conceptually differentiated, categorical self (Butterworth, 1990; Case, 1991; Filipp, 1980; Harter, 1983; Lewis & Brooks-Gunn, 1979).

As hallmarks of emerging intentionality, we may consider early behavioral adaptations that obviously aim at producing or evoking particular consequences (Bell, 1974). In contexts of parent-child interaction, such signs can be observed already in the first months of life, for example, in the instrumental use of vocalizations to influence the parent's behavior (Papousek & Papousek, 1989):

> How efficiently a 3-month-old infant can control parental behavior is readily observable, for example, in early interactive tickling games, when the child evokes the next repetition by an irresistible squealing. . . . The effectiveness of the contingency experience can be demonstrated easily by temporarily disrupting the child's expectations (e.g., by having the mother briefly close her eyes or turning unresponsively away from her child). . . . When this happens, even a 2-month-old child will activate a broad repertoire of facial, gestic, or vocal behaviors in an attempt to bring the mother back under his or her control. (Papousek & Papousek, 1989, p. 479; trans J. B.)

Recognition of regularities in behavior-effect contingencies is facilitated through the ritualization and mutual coordination of interactive exchanges between parent and child (Brazelton, Koslowski, & Main, 1974; Papousek & Papousek, 1987). The experience of transactional contingencies provides the raw material from which a working model develops that, initially in a rudimentary way, represents causal structures and instrumental relationships. Children in this early phase of development show exuberant emotional reactions when they become aware of their growing ability to produce interesting effects in a regular and reliable manner (Case, 1991; J. S. Watson, 1966). As mentioned earlier, caregivers arrange the child's action space to promote particular achievements, thus providing a scaffold for further development (Rogoff, 1990; Wood, Bruner, & Ross, 1976). Through affording facilitative means as well as through imposing external barriers and counterforces, the physical and social environment provides

feedback concerning actional potentials and limitations, thereby fostering the progressive differentiation of a conceptual or categorical self (e.g., Lewis & Brooks-Gunn, 1979).

As children come to separate self from nonself and to see external objects as distinct entities in their own right, they also recognize that actions can generate products that exist, and continue to exist, independently of productive activity, and that possess specific social valences. By the age of 18 months, children attentively monitor the products of their own actions: for example, in playing with building blocks, they pause when they have accomplished their task, and contemplate the result. Around this age, children begin to protest against and actively oppose interference with an intended course of action; this attests to a growing capability of goal-directed planning and an emerging sense of personal competence (Geppert & Küster, 1983; H. Heckhausen, 1984; Trudewind, Unzner, & Schneider, 1989).

An important step in the development of intentionality is the use of intermediary actions for achieving some goal, such as when a 10-month-old child removes an obstacle to recover a toy. Intentionality is manifested even more clearly when different means are employed to attain the same goal (Bruner, 1973; Piaget, 1936/1952). The material objects and means that are integrated more and more purposefully into sensorimotor coordinations during the first 2 years of life are not just "affordances" (Gibson, 1977) that expand the individual's action space; rather, it is in interaction with such means that experiences of success and failure are first made. The developmental significance of external objects of action has been stressed particularly in activity-theoretical approaches (Leont'ev, 1978; Oerter, 1991; Valsiner, 1987b; Vygotsky, 1978). The use of tools is the paradigm case: For efficient and successful action, the individual's behavior must accommodate to the functions and features of the tool. Being designed for, and in that sense objectifying, a particular type of problems, the mediating means of action—including external objects as well as "psychological tools" as defined earlier (Vygotsky, 1978)—also implicate particular developmental tasks: Achieving such tasks through adjusting to the functional demands of the tools is fostered by an intrinsic motivation for competence and self-agency (Harter, 1978; White, 1959). In early childhood, caregivers support the successful use of objects through structuring zones of activity; in later developmental stages, the guided acquisition of more complicated cultural practices and techniques typically takes the form of learning through apprenticeship (Rogoff, 1990). Thus, object-related and mediated action constitutes the basic process by which the individual comes to recognize the social nature of action and, gradually, to participate in social networks of knowledge and practice (Lave & Wenger, 1991; Valsiner, 1988a, 1988b; Vygotsky, 1978).

So far, we have addressed some first necessary steps in the genesis of intentional self-development. Further progress is crucially related to the acquisition of language, and to the development of self-related speech in particular. Speech-for-self is a potent means to overcome impediments and unexpected disruptions in an intended course of action and helps to control aversive emotions arising from these experiences (Kopp, 1989; Luria, 1969; Zivin, 1979). In self-referential dialogues, representations of desired and ought selves are actualized and translated into self-directive and self-corrective intentions (Lee, Wertsch, & Stone, 1983). Self-ascription of attributes denoting positively valued personal qualities (e.g., being good, strong, clever, polite) is necessarily tied to the medium of language; thus, emergence of first self-regulative intentions largely coincides and progresses in stride with the development of language. The acquisition of symbolic means to describe and evaluate oneself taps a centrally important source of self-regulatory motivation; as Kagan observes:

> [A]round the world, two- and three-year olds begin to reflect on the correctness, the competence, and the appropriateness of their actions before, during, and after execution. They compare their behavior, thoughts, and feelings against the standards and try to keep in close accord with the standard, as a space vehicle's program corrects its course in flight. (Kagan, 1984, pp. 129–130)

Development of Control-Related Beliefs and Motivations

Intentions of self-correction and self-development emerge through the contrast of two anticipatory beliefs; expectations of how developmental prospects might be ameliorated by corrective intervention are contrasted to the initial or baseline expectation of what would happen without such intervention. Such contrasts between "initial" and "revised" expectations (Valle & Frieze, 1976) become particularly salient in critical transitions and choice points in the life cycle. Generally, the range of feasible developmental options that individuals envisage

for themselves depends on the degree of personal control and efficacy that the actor ascribes to him- or herself.

The extent to which a person has control over life circumstances is jointly determined by personal and situational factors: Specifically, it depends on contingencies of the individual's developmental ecology and on his or her potential to act on these contingencies, which, in turn, depends on the availability of pertinent procedural knowledge as well as on the personal accessibility of such knowledge. These diverse aspects or facets are addressed in differentiations of the control construct such as the distinctions between "contingency judgments" and "competence judgments" (Weisz, 1983; Weisz & Cameron, 1985), between "response-outcome expectancies" and "efficacy expectations" (Bandura, 1977; H. Heckhausen, 1989), between "strategy beliefs" and "capacity beliefs" (E. A. Skinner, 1991, 1995; E. A. Skinner, Chapman, & Baltes, 1988), or, with signs reversed, between "universal helplessness" and "personal helplessness" (Abramson, Seligman, & Teasdale, 1978). It should be noted that the formal relation between these facets of perceived control is not symmetrical, in the sense that universal helplessness (the belief that an outcome is generally uncontrollable) implies personal helplessness, but not vice versa. This asymmetry seems important both from a motivational and developmental point of view because individuals will not form an intention to expand their control capacities unless they recognize that goals that are beyond their actual span of control are not necessarily unattainable in a general or universal sense.

These conceptual distinctions suggest two lines of approach for analyzing the development of control beliefs: We may ask, first, how a sense of personal agency grows from the individual's transactions with his or her social and material environment and unfolds into a differentiated system of control beliefs. Second, we should consider how ontogenetic and age-graded changes in physical, temporal, and social resources of action may affect perceived control and efficacy.

Developing a Sense of Control and Personal Agency

The perception of having control over events in the immediate environment implies the cognitive separation between the acting self and the external objects and effects of action, which is an essential achievement in early sensorimotor development. The progressive integration of instrumental objects, as well as of other persons, into own action sequences promotes an early sense of mediated agency or "proxy control" (Bandura, 1982b) and is germinal for the differentiation of means-end or contingency beliefs from efficacy beliefs. During early childhood, control experiences progressively gain an affective valence that not only stems from the pleasure experienced in the process of producing events but also increasingly reflects the valuation of outcomes in the wider social context. In the process of objectifying and instrumentalizing the physical and social environment, the child also comes to recognize his or her own body, and parts of it, as object and instrument. This is a cornerstone for the reflective processes through which the self as a physical and, later, as a psychological entity can become an object of intentional action.

Self-percepts of personal agency and control originate through the experience of behavior-event contingencies. Contextual factors such as the sensitivity and responsiveness of parents or the extent to which task environments or instructional contexts are adapted to the child's skill level and developmental potentials influence contingencies between actions, intentions, and outcomes and can become a source of interindividual differences in perceived control and self-efficacy (Gunnar, 1980; Lamb & Easterbrooks, 1981; E. A. Skinner, 1985, 1995). Again, generalization of contingency experiences and integration of them into a conceptual self is tied to language development. Between the ages of 2 and 3, children begin to grasp the semantic contents and symbolic qualities of their own behavior and to view themselves as having certain distinct qualities and traits. Preschoolers are motivated increasingly by anticipated self-evaluations, and they eagerly seek for occasions to test and confirm self-descriptions. Discerning competence and contingency as distinct constituents of personal agency, however, requires further cognitive and conceptual achievements; thus, it is not until middle childhood or, in Piagetian terms, until the stage of concrete operations has been reached that children acquire the distinction between alternative "internal" and "external" causes of performance such as ability, effort, task difficulty, and luck, and reflect such distinctions in self-evaluative reactions (Nicholls & Miller, 1984, 1985).

Although beginnings of a purposeful coordination of means and ends can be observed already by the 1st year of life, these early coordinations are practical and intuitive only. Attention is centered on immediate, concrete outcomes of actions; it is not until the emergence of "reflexive abstraction" in later stages of cognitive development (Piaget, 1976, 1978) that attention is turned to the

action processes themselves as well as the mechanisms that mediate between actions and outcomes. The representation of personal competencies and contextual contingencies typically attains the form of an implicit theory during preadolescence. The transition toward a hypothetico-deductive or formal-operational mode of thinking is characterized by a growing capacity to hypothetically project alternative courses of future personal development, which is the basic cognitive process that guides and motivates life planning and intentional self-development in adolescence and adulthood. However, concrete-operational children already begin to reflect about psychological functions such as memory, attention, or comprehension, and to use metacognitive strategies to control and enhance these functions (e.g., mnemonic strategies, techniques of attention control, comprehension monitoring; e.g., Flavell, Speer, Green, & August, 1981; Flavell & Wellmann, 1977; Markman, 1977; P. H. Miller & Bigi, 1979). Maintaining or boosting performance through metacognitive strategies remains an important concern of intentional self-development throughout life and becomes particularly focal in the elderly person's attempts to counteract, and compensate for, functional losses (Baltes & Baltes, 1990; Dixon & Bäckman, 1995).

Action Resources and Perceived Control

The development of action resources over the life span, in many areas at least, tends to follow a curvilinear function; in the earlier segments of the life span, the dominant trend is resource expansion, whereas later segments are characterized by maintenance and differential decrease in physical, temporal, social, and material reserves. A similar pattern of growth and decline has generally been expected for the experience of control and agency through life; however, empirical relationships have proved to be considerably more complex (e.g., Brandtstädter, Wentura, & Greve, 1993; J. Heckhausen & Schulz, 1995).

Individual differences in perceived control become manifest already by preschool age: In achievement-related contexts, for example, such differences are displayed in risk preferences, in reactions to failure, or in differential persistence on difficult tasks (H. Heckhausen, 1984). In contrast, the question regarding how the age variable relates to quantitative or qualitative differences in perceived control is far from being settled decisively. Considering the expansion of physical, psychological, and social action resources as well as the loosening, and progressive internalization, of external directives and regulations, one might expect an increase in internal-autonomous orientations of control from childhood to adolescence; this assumption gains plausibility in view of analogous shifts from heteronomous to autonomous perspectives in moral judgment (Rest, 1982; Selman, 1980). Although some findings seem to converge with this assumption, cross-sectional and longitudinal studies have not borne out a clear-cut and convergent trend (for overviews, see Krampen, 1987b; E. A. Skinner & Connell, 1986). I do not delve here into the methodological difficulties that plague this area of research (e.g., E. A. Skinner, 1995, for a discussion); obviously, an assessment of internality and externality beliefs poses serious conceptual problems as long as the child has not yet developed a corresponding analytic perspective. Generally, the assumption that perceived control or efficacy is a direct function of available action resources seems too simplistic. A personal sense of control and efficacy should depend primarily on the extent to which available action potentials are sufficient to realize personally important goals and developmental ambitions, or, conversely, reflect the extent to which personal goals and ambitions are adjusted to personal action potentials. We have to note at this juncture that after an expansion of action resources, goals and aspirations are often calibrated to a larger scale, which may involve new vulnerabilities. By the same token, a shrinking of action resources does not necessarily lead to losses in perceived control when goals are adjusted to changed developmental opportunities (e.g., Brandtstädter & Renner, 1990; Brandtstädter & Rothermund, 1994; J. Heckhausen & Schulz, 1995).

The theoretical significance of this principle becomes particularly evident when we consider later life. As I discuss in greater detail later, the accommodation of goals and plans to changed action resources is one of the key processes that helps the elderly person to preserve a sense of personal efficacy and a positive view of self and personal future.

Intentional Self-Development and the Developing Self

Activities of intentional self-development are related to the self in two senses. First, these activities as well as the processes of self-observation and self-evaluation on which they are based are reflexive; that is, they are directed back on the acting individuals themselves. Second, and this is a more complicated issue, such activities are also related to the person's self. These two meanings

are often confounded, and in the present context, they have to be distinguished carefully.

It has become customary to conceive the self—the conceptual or categorical self, or the "me" self as described by James (1890)—as a theory that the individual holds about him- or herself, and that grows out from the social requirement to give consistent and satisfying accounts for oneself and one's behavior (Epstein, 1973; Kihlstrom & Cantor, 1984; Markus, 1977). However, not all perceptions and beliefs that individuals may hold to be true about themselves refer to attributes that characterize and individuate them in essential ways. It therefore appears that the self, in the stronger sense of personal identity, is less, and in some sense more, than the totality of self-referential beliefs. To count as constituents of personal identity, self-descriptive attributes have to satisfy particular criteria (Baumeister, 1986; Brandtstädter & Greve, 1994; McGuire & McGuire, 1981). These attributes must be sufficiently enduring and constant: Only attributes that are sufficiently stable (or are construed by the individual as a stable self-descriptive feature) can warrant self-sameness over time. Furthermore, to be identity-relevant, attributes must also possess some distinctive relevance and contribute somehow to establishing the person's individuality. Finally, the attributes must be linked in relevant ways to the person's biography or life course and be seen by the person to form an essential particularity of his or her life. Activities of intentional self-development, as far as they serve to realize, stabilize, and maintain personal identity, will reach their full developmental expression when the individual is able to construe a self-schema of personal identity according to such criteria (Norem-Hebeisen, 1981).

The Ontogeny of the Conceptual Self and of Internalized Control

Objects that are seen by the child as belonging to him- or herself (toys or parts of the body) are the first distinctive markers of individuality (Kopp, 1982; Lewis & Brooks-Gunn, 1979). In early phases of development, identity is often construed by simple discriminative contrasts (child versus adult, boy versus girl); concrete, observable attributes are available earlier and more easily for self-description than abstract qualities (such as attitudes, dispositions, traits) that have to be inferred from observations (Broughton, 1978; Selman, 1980). Stable self-categorizations in terms of essential and invariant characteristics emerge in middle childhood in relationship with the comprehension of physical invariances at the level of concrete operational thinking. A central aspect of self-description, which also assumes a pivotal role in the further elaboration of a stable identity, is gender (Guardo & Bohan, 1971; Harter, 1983; Kohlberg, 1966; Marcus & Overton, 1978); particularly in societies with marked sex-role stereotyping, conceptions of an "ought" self are often introduced as prescriptions of how a girl or boy should behave or typically behaves (e.g., rules concerning the public display of emotions; e.g., Case, 1991; Stangor & Ruble, 1987, 1989).

Self-regulatory activity is based on self-evaluative standards or "self-guides" (Higgins, 1988) that form the person's desired and ought self. Self-evaluation and self-control originate from early, heteronomous states that are characterized by the external regulation of behavior through directives and physical constraints; with advancing representational capacities, children internalize external directives and apply evaluative and judgmental labels to themselves and their own actions. The emergence of internalized control is certainly one of the most central and significant achievements of early childhood (Diaz, Neal, & Amaya-Williams, 1991; Flavell, 1977; Kopp, 1982, 1987). The notion of internalization of normative orientations may be misleading as far as it connotes the simple transposing of external norms into an "inner" language of control. Rather, internalization should be seen as a constructive process by which external evaluations, standards, and norms are assimilated, interpreted, and realized in a manner corresponding to the child's actual developmental state and potential (Lawrence & Valsiner, 1993).

The emergence of internalized control is marked by the appearance of self-affects such as pride, guilt, or embarrassment, which are typically observed in achievement situations around the ages of 3 to 4 (H. Heckhausen, 1984). Children at this age vehemently protest against self-discrepant attributions ("I'm not a bad boy!"). Such early forms of self-assertion foreshadow processes of self-enhancement and self-verification that later become central aspects of intentional self-development (Kagan, 1981a). It is not until middle childhood, however, that self-evaluative concepts or standards are represented in episodic and semantic memory with sufficient complexity so that children can explicitly describe situations in which they would be proud or ashamed of themselves (Harter, 1983). Self-evaluative concepts—for example, personal notions of what it means to be good, competent, fair, or responsible—are continuously redefined and endowed with partly new meanings as cognitive and sociomoral

development advances. This process does not come to a halt at a particular age, but continues throughout life. The capacity and readiness to step back and critically evaluate oneself, one's actions, and later eventually one's personal development and the contour of life from the perspective of the generalized other and with respect to general ideals, maxims, or principles characterizes an advanced level of sociocognitive and sociomoral development that presupposes a formal-operational level of thought (Selman, 1980). It is on this level of cognitive development that individuals first become able to construe a possible self in terms of self-ideals and general ethical principles. Such ideals and principles essentially refer to the relation between the acting subject and his or her social, institutional, and cultural context. As individuals develop a progressively more comprehensive and differentiated view of these relationships, new and broader perspectives become accessible for self-definition and self-evaluation (Damon & Hart, 1982); this change in evaluative perspectives also influences the selection and definition of life goals and identity projects.

Future Selves, Life Plans, and Cultural Scripts

In adolescence and early adulthood, visionary construals of desired possible selves become the main motivational source of intentional self-development. In this transitional phase, constructions of the future self focus mainly on the domains of future occupation and beginning a family and partnership as well as on developmental tasks and prospects related to these domains (Dreher & Oerter, 1987; Nurmi, 1993; Pulkkinen, Nurmi, & Kokko, 2002). Elementary school children formulate ideas and plans about future roles in life, but these are often vague and fanciful. In adolescence, future goals become more elaborated; they reflect a broader range of realistic options and are linked with concrete procedural intentions and implementation goals (Rosenberg & Rosenberg, 1981; Russell & Smith, 1979).

During adulthood, personal projects and goals for the different segments of the life span eventually merge into a more or less comprehensive and coherent plan of life. Considering the ad hoc, incremental nature of planning about life, Rawls's (1971) contention that each individual "has a rational plan of life drawn up subject to the conditions that confront him" (p. 93) has to be taken with some skepticism. Most people have developed at least some ideas concerning the general contour of their life. These ideas are elaborated, adjusted, and reformulated according to actual constraints and affordances; conditions that often arise in an unpredictable fashion. In shaping and elaborating life plans, parents, partners, and significant others in general play a significant role, both as models and as mentors (Goodnow & Collins, 1990; Levinson, 1978; J. Smith, 1996). As individuals come to participate in social role systems of partnership, family, and occupation, it becomes increasingly necessary to coordinate and synchronize personal life plans with those of other individuals; quality and stability of marital partnerships largely depend on the compatibility and mutual adjustment of life goals (Brandtstädter et al., 1986; Felser, Schmitz, & Brandtstädter, 1998).

As the individual comes to relate his or her personal development to the norms and role systems of family and occupational cycles, social representations of "normal" or desirable development gain further influence in personal life-planning. Age-graded societies constrain and canalize intentional self-development through prescriptions or normative expectations concerning the proper scheduling of developmental events and transitions; in interaction with biological changes, such norms constitute a cultural script of a life course (Hagestad, 1991; Neugarten & Hagestad, 1976). Deviations from this script arouse attention and a need for explanation or justification. However, the normative force of cultural scripts of the life course also stems from the fact that deviations from the "normal" pattern have particular symbolic and attributional valences. Divergence from prescripted timetables for developmental transitions may, depending on the particular domain, be taken as a sign of incompetence, irresponsibility, indifference, or carelessness (Kalicki, 1996). As the individual moves through the life cycle, such symbolic valences gain influence in self-evaluation and intentional self-development.

A sense of personal identity and individuality is to an essential degree tied to those elements in the personal life course that deviate from normative or typical patterns; apparently, the cultural standardization of the individual life course tends to reduce its discriminative and individuating value. This problem is somewhat toned down by the fact that developmental tasks and normative expectations about the life course afford some latitude for idiosyncratic interpretation and implementation; thus, it becomes a developmental task of its own to interpret and implement the cultural script of the life course in ways that are compatible with personal goals and identity projects (e.g., Dittmann-Kohli, 1986).

The formation of personal identity does not end with a final and stable outcome but involves continual revisions and readjustments (Gergen & Gergen, 1987). In

response to the biological transitions and role changes across adolescence and adulthood, themes of intentional self-development as well as the personal importance of self-descriptive attributes also change (e.g., Cantor, Norem, Niedenthal, Langston, & Brower, 1987; Dreher & Oerter, 1986; Nurmi, 1992). The individual's position in educational, occupational, and family cycles influences the personal construal of desired, possible, and ought selves; during positional changes across the life cycle, different standards, rules, and comparative perspectives for self-evaluation become salient (Wells & Stryker, 1988). As individuals travel along the developmental and action paths that form their "thread of life" (Wollheim, 1984), they also tend to shift the temporal focus of self-definition; whereas young adults construe their identity primarily with regard to future possible selves, elderly people derive their self-definitions to an increasing degree from past achievements (Wong & Watt, 1991).

To some extent, however, these developmental adaptations also serve to stabilize and protect core elements of the self-system. As with scientific theories, adjustments in some parts of the structure can be necessary to deflect strain from other, more central parts. Generally, change in self-definitions across the life cycle is dampened by an inherent tendency of the self-system to preserve personal continuity and integration. Thus, the majority of longitudinal studies give testimony to an impressive stability of self-descriptions across adulthood (Bengtson, Reedy, & Gordon, 1985; Filipp & Klauer, 1985). This stability is particularly impressive in elderly individuals; the aging self appears to have powerful adaptive mechanisms at its disposal that defend the self-scheme against experiences of loss and limitation (Atchley, 1989). A comprehensive account of intentional self-development must certainly include some mention of the intentional and nonintentional processes that underlie the adjustment of self-evaluative standards and negotiation of gains and losses in the transition to later life. My final considerations address this issue.

Preserving Personal Continuity and Identity: Assimilative and Accommodative Processes

It has become obvious at this point that activities of intentional self-development must be viewed in the larger context of processes that serve to actualize and stabilize personal identity. During the entire life course, the individual is confronted with events and changes that he or she experiences as a gain or a loss, and as congruent or dissonant with the self-schema consolidated in earlier phases of life. Personal continuity, as well as crises and transformations of self-definition, essentially results from the ways in which such changes, in mentation and action, are negotiated.

The transition to old age brings with it particular threats to self-continuity and integrity. The late phases of life are characterized by the accumulation of uncontrollable changes and irreversible losses. Although there is a considerable amount of interindividual variation in biological, psychological, and social parameters of aging (e.g., Baltes & Mayer, 1999; Birren & Schaie, 1990; Rowe & Kahn, 1987; Schneider & Rowe, 1991), the curtailment of physiological reserve capacities, chronic and disabling health problems, and problems of bereavement and social isolation increasingly take their toll. These adaptive problems are further aggravated by the narrowing of lifetime resources; becoming aware that important personal goals can no longer be achieved in the remaining time is a particularly aversive experience in later life (Breytspraak, 1984). The picture of a gradual worsening in the subjective balance of developmental gains and losses also emerges from self-reports of elderly people (Brandtstädter et al., 1993; J. Heckhausen, Dixon, & Baltes, 1989). In sum, action resources tend to wane in later life, and questions regarding the projects and goals in which scarce resources should be invested take on an increasing significance.

Numerous research programs have centered on the plausible assumption that the experiences of loss, functional limitation, and social marginalization should have a negative impact on self-esteem, personal efficacy, and general well-being in later life. This assumption, however, has found surprisingly little empirical support. There is no general evidence that dissatisfaction, depression, or identity problems increase in later life, except perhaps in terminal phases in which severely disabling and life-threatening health problems loom large (Blazer, 1989; Newmann, 1989; Stock, Okun, Haring, & Witter, 1983). Likewise, there is no consistent evidence for reduced self-efficacy or perceived control. At every age, perceived control over personal development correlates positively with subjective and objective indicators of well-being such as health, life satisfaction, and optimism; however, individual differences in perceived control do not appear to be related systematically to the age variable (Fung, Abeles, & Carstensen, 1999; Lachman, 1986; Rodin, 1987).

This rather counterintuitive pattern of findings raises questions as to possible methodological artifacts.

With regard to the age-depression relationship, it has been argued, for example, that findings might be biased by a reduced motivation of depressed persons to participate in investigations; that relationships might be curvilinear; that elderly people might be more reluctant to report psychological problems; that symptoms of depression in old age often take on a masked or somatized form; or—considering the general predominance of cross-sectional over longitudinal investigations in these areas of research—that the empirical data are liable to confound genuine ontogenetic effects with generational differences (Blazer, 1989; Kessler, Foster, Webster, & House, 1992). These arguments are not examined in detail here, but it appears that they are not strong enough to explain away the phenomenal stability and integrity of the aging self; in fact, this phenomenon increasingly draws attention in developmental and gerontological research (Brandtstädter et al., 1993; Staudinger, Marsiske, & Baltes, 1995).

Here, the question arises as to what protective mechanisms the self-system engages to maintain personal continuity and a positive outlook on future development. From an action-theoretical perspective, two basic adaptive processes—or groups of processes—can be distinguished: On the one hand, individuals may try to alter the situation in an attempt to prevent or avoid undesired or self-discrepant outcomes, on the other hand, evaluative standards as well as underlying personal goals and ambitions may be adjusted to situational constraints. We denoted the former adaptive mode as assimilative and the latter as accommodative (Brandtstädter & Renner, 1990; Brandtstädter & Rothermund, 2002b). The present use of these concepts differs from the familiar Piagetian terminology because we are not referring here to modes of cognitive adaptation but rather to two complementary processes of achieving congruence between actual and desired situations or states.

Assimilative activities in the given sense essentially comprise all forms of intentional and problem-solving action that aim to keep developmental prospects in stride with personal goals and standards, or to alleviate goal discrepancies by actively changing situational conditions (personal life circumstances, behavioral patterns, or attributes). In old age, the preservation of personally valued physical, psychological, and social competencies becomes an important source of self-esteem and a dominant concern of assimilative efforts.

When assimilative actions fail to reduce actual discrepancies and losses, accommodative processes tend to be activated. By facilitating disengagement from barren goals, the accommodative process enhances a reorientation and commitment to new goals and self-evaluative standards, which may then become new reference points for assimilative activities. The theoretical distinction between accommodative and assimilative modes partly converges with other action-theoretical models that also imply a dual-process conception of coping, such as the model of problem-focused versus emotion-focused coping (Folkman, 1984; Lazarus & Launier, 1978), the theory of the incentive-disengagement cycle (Klinger, 1975, 1987), or the model of primary versus secondary control (J. Heckhausen & Schulz, 1995; Rothbaum, Weisz, & Snyder, 1982); relationships with these conceptions have been discussed in greater detail elsewhere (Brandtstädter & Renner, 1992).

Here, I shall discuss the assimilative and accommodative processes with regard to functional relationships and underlying mechanisms (see also Brandtstädter & Greve, 1994; Brandtstädter & Rothermund, 2002a, 2002b; Brandtstädter, Wentura, & Rothermund, 1999). The discussion focuses on development in late adulthood, but the basic theoretical principles apply to all situations in personal development that involve developmental losses and threats to personal identity.

Preventing or Alleviating Developmental Losses through Assimilative Activity

Preventive or corrective actions that are explicitly and intentionally designed to maintain desired performance standards or skills may be considered as prototypical cases of assimilative activities in later life. Depending on subjective means-ends beliefs and competencies, the implementation of such maintenance goals can take many forms, like physical exercise, dieting, a careful arrangement of daily routines, using cosmetic or pharmacological tools, and so on. Such self-corrective tendencies generally increase as experiences of functional losses and deficits loom larger; the strength of these relationships generally depends on the degree of perceived control over one's development and aging as well as on the personal importance of the domain in question (Brandtstädter, 1989).

Compensatory actions are another variant of assimilative activities that become particularly relevant when some functional losses are already irreversible. Compensation as such is a basic category of mediated human action, and, in a very general sense, any activity that employs auxiliary strategies and means to achieve some

goal that otherwise could not be attained involves an element of compensation (Vygotsky, 1960/1979). In later life, acts of compensation specifically aim at maintaining some desired standard of performance in spite of losses in task-relevant functions or skills. Because performance in particular tasks is generally determined by different skill components and external factors, a deterioration of particular components can often be offset by selective use or strengthening of those components that are still functioning well; depending on the functional domain under consideration, compensation may also involve the use of particular metacognitive strategies (e.g., mnemonic aids) or of external prosthetic means (Bäckman & Dixon, 1992; Baltes & Baltes, 1990; Salthouse, 1987). Activities of compensation tend to be most pronounced in areas that have high discriminative and biographical relevance and are of central importance to the person's identity. Like other activities of intentional self-development, compensatory actions depend on the availability of pertinent theoretical and technological knowledge as well as on its personal accessibility.

A further important category of assimilative activity comprises activities of self-verification (Swann, 1983). The self-verification construct refers to a general (but differentially expressed) tendency to preferentially select social or informational contexts that are likely to provide self-congruent feedback on those dimensions of self-description that are central or constitutive to personal identity (Greve, 1990; Rosenberg, 1979; Wicklund & Gollwitzer, 1982). To some extent, self-verification tendencies are already operative on automatic levels; for example, strong self-beliefs have an inherent tendency to reject or discredit discrepant information. This conservative effect may ward off self-discrepant evidence (at least as long as the evidence is not sufficiently strong to override the protective forces) and, in this case, would inhibit assimilative and accommodative responses equally. Only those activities of self-verification that intentionally aim at the purpose of reducing the salience of losses or avoiding self-discrepant feedback, however, should be considered as assimilative. For example, elderly people may strategically select social interactions to serve such self-enhancing intentions (e.g., Carstensen, 1993; Ward, 1984). People may even change their external appearance (e.g., through cosmetic surgery) in an attempt to elicit social feedback that conforms to their self-views (Swann, 1983).

A common feature of all assimilative activities is a tenacious adherence to certain goals, ambitions, or standards. Intensity and duration of assimilative activities essentially depend on perceived personal competence and efficacy; if initial control beliefs are strong, difficulties in executing assimilative intentions may incite additional assimilative effort, and even induce a reactant increase of the blocked goal's valence (Klinger, 1975; Wortman & Brehm, 1975; Wright & Brehm, 1989). When the individual is confronted with factually irreversible losses or impairments, however, this tenacity may lead to an inefficient use of resources and eventually aggravate feelings of helplessness and depression. Here, possible dysfunctional implications of control beliefs then become apparent, and these implications are gaining increasing attention in clinical and developmental research (Coyne, 1992; Janoff-Bulman & Brickman, 1982; Thompson, Cheek, & Graham, 1988).

As long as assimilative processes dominate, accommodative reactions are inhibited; if personal standards or ambitions can be maintained without difficulty, there is no need for revising them. However, when action resources decrease, assimilative activities may become increasingly difficult and taxing. To borrow terms from economics, the "production-possibility frontier" (Samuelson & Nordhaus, 1985) narrows with decreasing production reserves, so that a desired level of production in one domain can be maintained only by lowering levels in other domains. The shrinking of action resources in later life should have analogous effects: To maintain desired standards in some specific domain, the individual may be forced to downgrade standards in other domains. For example, in some fields of athletic activity, older individuals may successfully maintain performance levels through forced training and sophisticated use of physical reserves (Ericsson, 1990); with advancing age, however, such efforts become increasingly taxing. The psychological problems of aging largely stem from the fact that efforts to compensate for functional losses are subject to a principle of diminishing returns, so that the opportunity costs of maintaining particular standards eventually outweigh the benefits. Under such circumstances, the only way of avoiding or neutralizing feelings of permanent frustration and helplessness is by adjusting goals and ambitions to situational constraints and changed action resources.

Accommodative Processes: Adjusting Goals to Actional Resources

Notions of gain and loss in development involve evaluative elements; whether developmental outcomes or

changes are individually experienced as gains or losses depends on how they relate to the person's goals and projects. Accordingly, losses or goal discrepancies may be eliminated not only by changing the actual situation but also by accommodating goals and self-evaluative standards. Such processes largely operate on nonintentional levels. Thus, the consideration of these mechanisms take us partly beyond the scope of the paradigm of intentional action; it is nevertheless of central importance to understanding the dynamics of intentional self-development over the life course (see also E. A. Skinner, 1995).

Prototypical facets of the accommodative mode involve the devaluation and disengagement of blocked goals, the rescaling of aspirations, and the positive reappraisal of alternative options. Accommodative processes also include interpretative processes that lead to an acceptance of an initially aversive situation, and thus may facilitate disengagement from barren ambitions. Whereas assimilative activities imply a tenacious adherence to goals and standards, the accommodative process is characterized by the flexible adjustment of goals to situational constraints. Rescaling of standards and aspirations has often been considered to be an inferior form of coping, and has been associated with notions of hopelessness, resignation, or depression. Such connotations are misleading; in fact, feelings of hopelessness and helplessness indicate difficulties in letting go of blocked goals or deficits in accommodative flexibility.

Empirical findings from different lines of research hint at the importance of accommodative processes for neutralizing experiences of loss and stabilizing a positive sense of self in later life. Thus, people tend to devalue developmental goals that have drifted beyond feasible ranges; this tendency appears to be less expressed in depressive subjects (Brandtstädter & Baltes-Götz, 1990). Similarly, persons suffering physical impairments tend to adjust to their handicaps by rearranging goals and ambitions (Schulz & Decker, 1985). Conversely, the difficulty in letting go of barren ambitions appears to be a characteristic of depression (Carver & Scheier, 1990); thus, in later life, continued pursuit of "youthful" goals and self-ideals may thus become a source of continued discontent (Miskimins & Simmons, 1966). Measures of accommodative flexibility have been found to predict coping with problems such as chronic pain, reduced health, or physical handicaps (Brandtstädter et al., 1993; Schmitz, Saile, & Nilges, 1996). Moreover, the intriguing stability of generalized control beliefs in later life seems to depend essentially on the accommodation of goals to available resources (Brandtstädter & Rothermund, 1994; G. Brim, 1992). With advancing age, preferred modes of coping shift from assimilative-offensive to accommodative forms; in view of the increase of uncontrollable and irreversible losses in later life, this shift is consistent with theoretical expectations.

The readiness or ability to accommodate goals to situational constraints depends on situational and personal conditions. Individuals will find it most difficult to disengage from goals that are central to their identity and for which substitutes or functional equivalents are not easily available. High "self-complexity" (Linville, 1987), that is, a highly diversified and multifocal self-structure may enhance disengagement from barren life projects and commitment to new goals. A further significant factor that may differ across situations and persons concerns the ability to shift the meanings of aversive states or losses so that these eventually become acceptable. In aversive mood states, accessibility of palliative meanings seems to be lowered by a tendency of the cognitive system to generate mood-congruent cognitions (Blaney, 1986). We should therefore expect that accommodative processes engage mechanisms that override such congruency effects (e.g., S. E. Taylor, 1991).

As suggested earlier, such auxiliary mechanisms presumably operate on a subpersonal, automatic level. Accommodation of goals and ambitions needs not to be and often cannot be actuated intentionally, although it may have a directive influence on the individual's intentions and decisions. The process of accommodation, however, does not start but rather ends with a decision to abandon a goal or dissolve a commitment. Disengagement from barren commitments can be enhanced to some extent by the planful use of self-management and self-instruction techniques, but, like other nonintentional or automatic processes, it can be brought under personal control only in such mediated, technical ways. Just as we cannot accept any beliefs apart from those that seem sufficiently plausible within the context of the beliefs we already hold, so too we are unable to discard a goal merely because it seems advantageous to do so (e.g., Gilbert, 1993; Kunda, 1990). Action-theoretical research increasingly pays attention to the role that such unintentional or subpersonal automatisms play in the regulation of action (Bargh & Chartrand, 1999; Brandtstädter, 2000).

Among the automatisms that support the accommodative process, mechanisms of attention regulation are of prime importance. As already discussed, atten-

tion generally focuses on situational aspects that are relevant to an ongoing course of action: This suggests that scarce attentional resources tend to be withdrawn from problems that are perceived to be uncontrollable or have turned out to be so (Brandtstädter & Renner, 1992). Decentering of attention from uncontrollable problems may be supported by a compensatory tendency to focus on affectively incongruent stimuli (i.e., on stimuli with positive affective valence) after negative feedback (Derryberry, 1993; Rothermund, 2003; Tipper & Cranston, 1985). Particular types of problems, however, may continue to bind attention even after repeated futile attempts to solve them; this is particularly true of problems that are personally so important that continued assimilative efforts have a high subjective utility even under very low probability of success. Under such conditions, problem-focused thinking may degenerate into ruminative thinking that cycles around the blocked goal and its implications (Martin & Tesser, 1989; Martin, Tesser, & McIntosh, 1993); in the dual-process model, such ruminative thought would be symptomatic of difficulties in shifting from assimilative to accommodative modes. However, ruminative thinking may also promote accommodation because it may enhance the finding of positive meanings, which, due to their palliative effects, should also have a greater chance to be accepted as valid (Brandtstädter & Renner, 1992; Wentura, 1995). Generally, to deconstruct aversive implications of a problem, information has to be generated that invalidates or undermines the aversive conclusions or the underyling premises; this form of focused, preference-driven thinking involves a positivity bias because the search for further information tends to be stopped after the desired positive result has been reached (Kruglanski, 1990; Kunda, 1990).

The distinction between assimilative and accommodative processes that we have addressed in these final considerations may recall traditional distinctions between active and passive concepts of happiness (Tatarkiewicz, 1976); philosophical notions of wisdom have emphasized the importance of finding the right balance between these two stances. Wisdom, however defined, implies not only knowledge as to which goals are important in life and how these goals may be achieved but also involves a sense as to which limitations are unavoidable and how necessities can be accepted (Kamlah, 1973; Nozick, 1989). Intentional self-development across the life span is based on this interplay between engagement and disengagement, between tenacious goal pursuit and flexible goal adjustment. From the theoretical analysis of these complementary tendencies, a better understanding is gained of how continuity and change both pervade and enable each other in personal development during the life span.

SUMMARY AND CONCLUSIONS

Cultural systems maintain and perpetuate themselves by regulating and controlling developmental processes during the life span; within the matrix of sociocultural affordances and constraints, the developing person builds and tries to optimize his or her personal course of development. Throughout life, individuals are actively engaged in keeping their development in stride with social and personal representations of "successful" development over the life span, and they strive to achieve a favorable balance of developmental gains and losses that conforms to their self-definitions and identity goals. Proceeding on these basic tenets, I have advanced the view that human ontogeny, in theory and research, cannot be understood adequately without taking into account the representational and regulative processes through which individuals control their own and others' development. Goal-directed action is both a driving force and an outcome of personal development over the life span, and the present chapter has made an attempt to integrate both facets.

In contrast to traditional programmatic debates, I hold the view that the merits of any developmental "paradigm" should not be judged on an a priori basis, but in light of its heuristic power and with regard to the quality of related research. In this sense, a general strength of action perspectives, which has been stressed throughout this chapter, lies in their potential to integrate cultural, historical, and personal aspects of human ontogeny. This integrative power essentially stems from the fact that the concept of action is inherently linked to these different analytical levels. Related to this point, action perspectives on development are distinctive in how they account for phenomena of stability and change, of diversity and universality in human ontogeny. An action perspective suggests that stability as well as diversity of developmental patterns are essentially related to the particular arrangement of developmental affordances and constraints prevailing in a given sociohistorical context and reflect the ways in which individuals, through constructive and selective activity, make use of and act on these contextual conditions. Thus, the action paradigm provides a framework for integrating theoretical

stances that emphasize the malleability and contextual relativity of developmental trajectories. This does not necessarily imply that the traditional issues of continuity, connectedness, and universality would be anathema to an action perspective on development. I have argued to the contrary that the consideration of the different types of constraints that shape and constitute development in cultural and personal contexts of action may help to gain a better understanding of these traditional issues. Though not discarding the notion of causal connectivity in development, an action perspective posits that coherence and continuity in development essentially depend on the way in which, on the cultural and personal level, causal mechanisms are exploited to construct and deconstruct developmental contingencies.

As has become evident throughout this chapter, an action perspective on development cannot be reduced to a single theory in the formal sense. Accordingly, it would be questionable to single out a particular research program as prototypically representative of this stance. The research examples given in the present chapter cover a broad spectrum of themes across the whole life span. With regard to child development, researchers have documented the role that co-constructive interactions between the child and the material and social environment play in the formation of skills and competencies, and in the genesis of self-representations from which activities of intentional self-development originate. In the field of adolescent and adult development, efforts have been made to elucidate how personal goals, values, and control beliefs interact in the processes of life-planning and intentional self-development, and how personal and contextual influences shape and modify these orientations as the individual moves through his or her developmental history. With regard to later life, increasing emphasis is laid on the activities and processes by which the aging person maintains personal continuity, counteracts developmental losses, and adjusts personal projects to changes in functional reserves. Action-theoretical constructs such as life tasks, personal strivings, self-regulation, future perspectives, self-efficacy, perceived control, life planning, self-verification, or compensation have served as guiding concepts in this research and have become the nuclei of productive theorizing. Although action-theoretical approaches traditionally have an affinity toward hermeneutic or interpretative methods, it is increasingly recognized that a comprehensive analysis of the functional interdependencies between development, culture, and action would be hampered by any methodological parochialism. Current research freely uses, and often strategically combines, a broad gamut of methods ranging from experimental and microprocessual analyses to observational strategies and biographical interviews.

Beyond the theoretical issues on which this chapter has primarily centered, an action perspective on development has particular practical and ethical implications. As long as developmental processes are viewed from a narrow causalist or mechanist stance, they are not amenable to rational or moral evaluations. When we consider the personal and collective actions that shape and constrain development, then such evaluations become possible and legitimate. The assumptions, expectations, and theoretical premises that guide goal-directed activities may be evaluated for consistency and validity; goals and plans of action may be analyzed with respect to their realizability, intra- and interindividual consistency, and compatibility with ethical standards. This is equally true for activities related to the control of development; all the more so because developmental problems often reflect incompatibilities in the system of goals, values, affordances, and constraints that shape development on personal and social levels of action. An action perspective on development thus suggests that any effort at "optimizing" development should involve a critical analysis of the beliefs and normative expectations that, tacitly or explicitly, undergird the personal and social regulation of human ontogeny. It also may sensitize developmentalists to the fact that the results of their research and theorizing, when reintroduced into the contexts of socialization and intentional self-development, become part of the antecedent conditions of the processes that they are studying.

REFERENCES

Abramson, L. J., Seligman, M. E. P., & Teasdale, E. J. D. (1978). Learned helplessness in humans: Critique and reformulation. *Journal of Abnormal Psychology, 87,* 49–74.

Aebli, H. (1980). *Denken: Das Ordnen des Tuns—Kognitive Aspekte der Handlungstheorie* (Vol. 1). Stuttgart, Germany: Klett-Cotta.

Aebli, H. (1987). Mental development: Construction in a cultural context. In B. Inhelder, D. de Caprona, & A. Cornu-Wells (Eds.), *Piaget today* (pp. 217–232). Hillsdale, NJ: Erlbaum.

Ajzen, I. (1988). *Attitudes, personality, and behavior.* Chicago: Dorsey Press.

Allport, A. (1987). Selection for action: Some behavioral and neurophysiological considerations of attention and action. In H. Heuer & A. F. Sanders (Eds.), *Perspectives on perception and action* (pp. 395–419). Hillsdale, NJ: Erlbaum.

Anderson, A. R., & Belnap, N. D., Jr. (1975). *Entailment: The logic of relevance and necessity* (Vol. 1). Princeton, NJ: Princeton University Press.

Arendt, H. (1976). *The life of the mind: Vol. 1. Thinking*. London: Secker & Warburg.

Atchley, R. C. (1989). A continuity theory of normal aging. *Gerontologist, 29,* 183–190.

Atkinson, J. W. (1970). *The dynamics of action.* New York: Wiley.

Austin, J. L. (1956). A plea for excuses. *Proceedings of the Aristotelian Society, 57,* 1–30.

Averill, J. A. (1980). A constructivistic view of emotion. In R. Plutchik & H. Kellerman (Eds.), *Emotion: Theory, research, and experience: Vol. 1. Theories of emotion* (pp. 305–339). New York: Academic Press.

Bäckman, L., & Dixon, R. A. (1992). Psychological compensation: A theoretical framework. *Psychological Bulletin, 112,* 259–283.

Baltes, P. B. (1987). Theoretical propositions of life-span developmental psychology: On the dynamics between growth and decline. *Developmental Psychology, 23,* 611–626.

Baltes, P. B. (1993). The aging mind: Potential and limits. *Gerontologist, 33,* 580–594.

Baltes, P. B., & Baltes, M. M. (1990). Psychological perspectives on successful aging: The model of selective optimization with compensation. In P. B. Baltes & M. M. Baltes (Eds.), *Successful aging: Perspectives from the behavioral sciences* (pp. 1–34). New York: Cambridge University Press.

Baltes, P. B., Cornelius, S. W., & Nesselroade, J. R. (1979). Cohort effects in developmental psychology. In J. R. Nesselroade & P. B. Baltes (Eds.), *Longitudinal research in the study of behavior and development* (pp. 61–87). New York: Academic Press.

Baltes, P. B., & Mayer, K. U. (1999). *The Berlin Aging Study: Aging from 70 to 100.* Cambridge, England: Cambridge University Press.

Baltes, P. B., & Reese, H. W. (1984). The life-span perspective in developmental psychology. In M. H. Bornstein & M. E. Lamb (Eds.), *Development psychology: An advanced textbook* (pp. 493–531). Hillsdale, NJ: Erlbaum.

Baltes, P. B., Reese, H. W., & Lipsitt, L. P. (1980). Life-span developmental psychology. *Annual Review of Psychology, 31,* 65–110.

Baltes, P. B., & Schaie, K. W. (1974). The myth of the twilight years. *Psychology Today, 7*(10), 35–40.

Balzer, W., & Moulines, C. U. (1980). On theoreticity. *Synthese, 44,* 467–494.

Balzer, W., Moulines, C. U., & Sneed, J. D. (1987). *An architectonic for science: The structuralist program.* Dordrecht: Reidel.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84,* 191–215.

Bandura, A. (1981). Self-referent thought: A developmental analysis of self-efficacy. In J. H. Flavell & L. Ross (Eds.), *Social cognitive development: Frontiers and possible futures* (pp. 200–239). Cambridge, England: Cambridge University Press.

Bandura, A. (1982a). The psychology of chance encounters and life paths. *American Psychologist, 37,* 747–755.

Bandura, A. (1982b). Self-efficacy mechanisms in human agency. *American Psychologist, 37,* 122–147.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory.* Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A. (1989). Self-regulation of motivation and action through internal standards and goal systems. In L. A. Pervin (Ed.), *Goal concepts in personality and social psychology* (pp. 19–85). Hillsdale, NJ: Erlbaum.

Bandura, A. (1991). Self-regulation of motivation through anticipating and self-regulatory mechanisms. In R. A. Dienstbier (Ed.), *Nebraska Symposium on Motivation: Vol. 39. Perspectives on motivation* (pp. 69–164). Lincoln: University of Nebraska Press.

Bandura, A. (1997). *Self-efficacy: The exercise of control.* New York: Freeman.

Bargh, J. A., & Chartrand, T. L. (1999). The unbearable automaticity of being. *American Psychologist, 54,* 462–479.

Baumeister, R. F. (1986). *Identity: Cultural change and the struggle for self.* New York: Oxford University Press.

Baumeister, R. F., Heatherton, T. F., & Tice, D. M. (1994). *Losing control: How and why people fail at self-regulation.* San Diego, CA: Academic Press.

Baumrind, D. (1989). The permanence of change and the impermanence of stability. *Human Development, 32,* 187–195.

Bell, R. Q. (1974). Contributions of human infants to caregiving and social interaction. In M. Lewis & L. A. Rosenblum (Eds.), *The effect of the infant on its caregiver* (pp. 1–19). New York: Wiley.

Bengtson, V. L., Reedy, M. N., & Gordon, C. (1985). Aging and self-conceptions: Personality processing and social contexts. In J. E. Birren & K. W. Schaie (Eds.), *Handbook of the psychology of aging* (pp. 544–593). New York: Van Nostrand.

Berger, C. R. (1993). Goals, plans, and mutual understanding in relationships. In S. Duck (Ed.), *Individuals in relationships* (pp. 30–59). Newbury Park: Sage.

Berzonsky, M. (1988). Self-theorists, identity status, and social cognition. In D. K. Lapsley & F. C. Power (Eds.), *Self, ego, and identity* (pp. 243–292). New York: Springer.

Bijou, S. W., & Baer, D. M. (1961). *Child development: Vol. 1. A systematic and empirical theory.* New York: Appleton-Century-Crofts.

Birren, J. E., & Schaie, K. W. (Eds.). (1990). *Handbook of the psychology of aging* (3rd ed.). San Diego, CA: Academic Press.

Blaney, P. H. (1986). Affect and memory. *Psychological Bulletin, 99,* 299–246.

Blazer, D. (1989). Depression in late life: An update. *Annual Review of Gerontology and Geriatrics, 9,* 197–215.

Block, J. (1971). *Lives through time.* Berkeley, CA: Bancroft.

Bloom, B. S. (1964). *Stability and change in human characteristics.* New York: Wiley.

Boesch, E. E. (1980). *Kultur und Handlung: Einführung in die Kulturpsychologie.* Bern, Switzerland: Huber.

Boesch, E. E. (1991). *Symbolic action theory in cultural psychology.* Berlin, Germany: Springer.

Bourdieu, P. (1977). *Outline of a theory of practice.* Cambridge, England: Cambridge University Press.

Bourdieu, P., & Passeron, J.-C. (1977). *Reproduction in education, society and culture.* Beverly Hills, CA: Sage.

Brainerd, J. (1978). The stage question in cognitive-developmental theory. *The Behavioral and Brain Sciences, 1,* 173–213.

Brand, M. (1984). *Intending and acting: Toward a naturalized action theory.* Cambridge, MA: MIT Press.

Brandtstädter, J. (1982). Apriorische Elemente in psychologischen Forschungsprogrammen. *Zeitschrift für Sozialpsychologie, 13,* 267–277.

Brandtstädter, J. (1984a). Action development and development through action. *Human Development, 27,* 115–119.

Brandtstädter, J. (1984b). Personal and social control over development: Some implications of an action perspective in life-span developmental psychology. In P. B. Baltes & O. G. Brim Jr. (Eds.), *Life-span development and behavior* (Vol. 6, pp. 1–32). New York: Academic Press.

Brandtstädter, J. (1984c). Entwicklung in Handlungskontexten: Aussichten für die entwicklungspsychologische Theorienbildung und Anwendung. In H. Lenk (Ed.), *Handlungstheorien interdisziplinär: Vol. 3. II. Wissenschaftliche und psychologische Handlungstheorien* (pp. 848–878). München, Germany: Fink.

Brandtstädter, J. (1985a). Entwicklungsberatung unter dem Aspekt der Lebensspanne: Zum Aufbau eines entwicklungspsychologischen Anwendungskonzepts. In J. Brandtstädter & H. Gräser (Ed.), *Entwicklungsberatung unter dem Aspekt der Lebensspanne* (pp. 1–15). Göttingen, Germany: Hogrefe & Huber.

Brandtstädter, J. (1985b). Individual development in social action contexts: Problems of explanation. In J. R. Nesselroade & A. von Eye (Eds.), *Individual development and social change: Explanatory analysis* (pp. 243–264). New York: Academic Press.

Brandtstädter, J. (1987). On certainty and universality in human development: Developmental psychology between apriorism and empiricism. In M. Chapman & R. A. Dixon (Eds.), *Meaning and the growth of understanding: Wittgenstein's significance for developmental psychology* (pp. 69–84). Berlin, Germany: Springer.

Brandtstädter, J. (1989). Personal self-regulation of development: Cross-sequential analyses of development-related control beliefs and emotions. *Developmental Psychology, 25,* 96–108.

Brandtstädter, J. (1992). Personal control over development: Some developmental implications of self-efficacy. In R. Schwarzer (Ed.), *Self-efficacy: Thought control of action* (pp. 127–145). New York: Hemisphere.

Brandtstädter, J. (1999). The self in action and development: Cultural, biosocial, and ontogenetic bases of intentional self-development. In J. Brandtstädter & R. M. Lerner (Eds.), *Action and self-development: Theory and research through the life span* (pp. 37–65). Thousand Oaks, CA: Sage.

Brandtstädter, J. (2000). Emotion, cognition, and control: Limits of intentionality. In W. J. Perrig & A. Grob (Eds.), *Control of human behavior, mental processes, and consciousness* (pp. 3–16). Mahwah, NJ: Erlbaum.

Brandtstädter, J. (2001). *Entwicklung—Intentionalität—Handeln.* Stuttgart, Germany: Kohlhammer.

Brandtstädter, J., & Baltes-Götz, B. (1990). Personal control over development and quality of life perspectives in adulthood. In P. B. Baltes & M. M. Baltes (Eds.), *Successful aging: Perspectives from the behavioral sciences* (pp. 197–224). New York: Cambridge University Press.

Brandtstädter, J., & Greve, W. (1994). The aging self: Stabilizing and protective processes. *Developmental Review, 14,* 52–80.

Brandtstädter, J., Krampen, G., & Heil, F. E. (1986). Personal control and emotional evaluation of development in partnership relations during adulthood. In M. M. Baltes & P. B. Baltes (Eds.), *The psychology of aging and control* (pp. 265–296). Hillsdale, NJ: Erlbaum.

Brandtstädter, J., & Lerner, R. M. (Eds.). (1999). *Action and self-development: Theory and research through the life span.* Thousand Oaks, CA: Sage.

Brandtstädter, J., & Renner, G. (1990). Tenacious goal pursuit and flexible goal adjustment: Explication and age-related analysis of assimilative and accommodative strategies of coping. *Psychology and Aging, 5,* 58–67.

Brandtstädter, J., & Renner, G. (1992). Coping with discrepancies between aspirations and achievements in adult development: A dual-process model. In L. Montada, S.-H. Filipp, & R. M. Lerner (Eds.), *Life crises and experiences of loss in adulthood* (pp. 301–319). Hillsdale, NJ: Erlbaum.

Brandtstädter, J., & Rothermund, K. (1994). Self-percepts of control in middle and later adulthood: Buffering losses by rescaling goals. *Psychology and Aging, 9,* 265–273.

Brandtstädter, J., & Rothermund, K. (2002a). Intentional self-development: Exploring the interfaces between development, intentionality, and the self. In L. J. Crockett (Ed.), *Nebraska Symposium on Motivation: Vol. 48. Agency, motivation, and the life course* (pp. 31–75). Lincoln: University of Nebraska Press.

Brandtstädter, J., & Rothermund, K. (2002b). The life-course dynamics of goal pursuit and goal adjustment: A two-process framework. *Developmental Review, 22,* 117–150.

Brandtstädter, J., & Wentura, D. (1994). Veränderungen der Zeit- und Zukunftsperspektive im Übergang zum höheren Erwachsenenalter: Entwicklungspsychologische und differentielle Aspekte. *Zeitschrift für Entwicklungspsychologie und Pädagogische Psychologie, 26,* 2–21.

Brandtstädter, J., Wentura, D., & Greve, W. (1993). Adaptive resources of the aging self: Outlines of an emergent perspective. *International Journal of Behavioral Development, 16,* 232–349.

Brandtstädter, J., Wentura, D., & Rothermund, K. (1999). Intentional self-development through adulthood and later life: Tenacious pursuit and flexible adjustment of goals. In J. Brandtstädter & R. M. Lerner (Eds.), *Action and self-development: Theory and research through the life span* (pp. 373–400). Thousand Oaks, CA: Sage.

Brazelton, T. B., Koslowski, B., & Main, M. (1974). The origins of reciprocity: The early mother-infant interaction. In M. Lewis & L. A. Rosenblum (Eds.), *The effect of the infant on its caregiver* (pp. 45–76). New York: Wiley.

Breytspraak, L. M. (1984). *The development of self in later life.* Boston: Little, Brown.

Brim, G. (1992). *Ambition: How we manage success and failure throughout our lives.* New York: Basic Books.

Brim, O. G., Jr., & Kagan, J. (1980). Constancy and change: A view of the issues. In O. G. Brim Jr. & J. Kagan (Eds.), *Constancy and change in human development* (pp. 1–25). Cambridge, MA: Harvard University Press.

Bronfenbrenner, U. (1979). *The ecology of human development.* Cambridge, MA: Harvard University Press.

Bronfenbrenner, U., & Morris, P. A. (1998). The ecology of developmental processes. In R. M. Lerner (Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 993–1028). New York: Wiley.

Broughton, J. (1978). Development of concepts of self, mind, reality, and knowledge. *New Directions for Child Development, 1,* 75–100.

Bruner, J. S. (1972). The nature and uses of immaturity. *American Psychologist, 27,* 687–708.

Bruner, J. S. (1973). The organization of early skilled action. *Child Development, 44,* 1–11.

Bruner, J. S. (1982). The organization of action and the nature of adult-infant transaction. In M. von Cranach & R. Harré (Eds.), *The analysis of action* (pp. 313–327). Cambridge, England: Cambridge University Press.

Bruner, J. S. (1990a). *Acts of meaning.* Cambridge, MA: Harvard University Press.

Bruner, J. S. (1990b). Culture and human development: A new look. *Human Development, 33,* 344–355.

Brunstein, J. C., Schultheiss, O. C., & Maier, G. W. (1999). The pursuit of personal goals: A motivational approach to well-being and life adjustment. In J. Brandtstädter & R. M. Lerner (Eds.), *Action and self-development: Theory and research through the life span* (pp. 169–196). Thousand Oaks, CA: Sage.

Bühler, C. (1933). *Der menschliche Lebenslauf als psychologisches Problem.* Leipzig, Germany: Hirzel.

Bühler, C., & Marschak, M. (1969). Grundtendenzen des menschlichen Lebens. In C. Bühler & F. Massarik (Eds.), *Lebenslauf und Lebensziele* (pp. 78–88). Stuttgart, Germany: Fischer.

Bullock, M. (Ed.). (1991). *The development of intentional action: Cognitive, motivational, and interactive processes—Contributions to Human Development* (Vol. 22). Basel, Switzerland: Karger.

Bunge, M. (1979). *Causality and modern science* (3rd ed.). New York: Dover.

Busch-Rossnagel, N. A. (1981). Where is the handicap in disability? The contextual impact of physical disability. In R. M. Lerner & M. Busch-Rossnagel (Eds.), *Individuals as producers of their development: A life-span perspective* (pp. 312–281). New York: Academic Press.

Butterworth, G. (1990). Self-perception in infancy. In D. Cicchetti & M. Beeghly (Eds.), *The self in transition: Infancy to childhood* (pp. 119–137). Chicago: University of Chicago Press.

Cairns, R. B. (1983). The emergence of developmental psychology. In W. Kessen (Ed.), *Handbook of child psychology: Vol. 1. History, theory, and methods* (pp. 41–102). New York: Wiley.

Cantor, N., & Fleeson, W. (1991). Life tasks and self-regulatory processes. In M. L. Maehr & P. R. Pintrich (Eds.), *Advances in motivation and achievement* (Vol. 7, pp. 327–369). Greenwich, CT: JAI Press.

Cantor, N., Markus, H., Niedenthal, P., & Nurius, P. (1986). On motivation and the self concept. In R. M. Sorrentino & E. T. Higgins (Eds.), *Handbook of motivation and cognition: Vol. 1. Foundations of social behavior* (pp. 96–121). New York: Guilford Press.

Cantor, N., Norem, J. K., Niedenthal, P. M., Langston, C. A., & Brower, A. M. (1987). Life tasks, self-concept ideals and cognitive strategies in a life transition. *Journal of Personality and Social Psychology, 53,* 1178–1191.

Care, N. S., & Landesman, C. (Eds.). (1968). *Readings in the theory of action.* Bloomington: Indiana University Press.

Carey, S. (1982). Semantic development: The state of the art. In E. Wanner & L. R. Gleitman (Eds.), *Language acquisition: The state of the art* (pp. 347–389). New York: Cambridge University Press.

Carstensen, L. L. (1993). Motivation for social contact across the life span: A theory of socioemotional selectivity. In J. E. Jacobs (Ed.), *Nebraska Symposium on Motivation: Vol. 40. Developmental perspectives on motivation* (pp. 209–254). Lincoln: University of Nebraska Press.

Carus, F. A. (1823). *Psychologie: Erster Band* (2nd ed.). Leipzig, Germany: Barth & Kummer.

Carver, C. S., & Scheier, M. F. (1981). *Attention and self-regulation: A control-theory approach to human behavior.* New York: Springer.

Carver, C. S., & Scheier, M. F. (1986). Self and the control of behavior. In L. M. Hartman & K. R. Blankstein (Eds.), *Perception of self in emotional disorder and psychotherapy* (pp. 5–35). New York: Plenum Press.

Carver, C. S., & Scheier, M. F. (1990). Origins and functions of positive and negative affect: A control-process view. *Psychological Review, 97,* 19–35.

Carver, C. S., & Scheier, M. F. (1998). *On the self-regulation of behavior.* New York: Cambridge University Press.

Carver, C. S., & Scheier, M. F. (2003). Three human strengths. In L. G. Aspinwall & U. M. Staudinger (Eds.), *A psychology of human strengths: Fundamental questions and future directions for a positive psychology* (pp. 87–102). Washington, DC: American Psychological Association.

Case, R. (1991). Stages in the development of the young child's first sense of self. *Developmental Review, 11,* 210–230.

Chapman, M. (1984). Intentional action as a paradigm for developmental psychology: A symposium. *Human Development, 27,* 113–114.

Chess, S., & Thomas, A. (1984). *The origins and evolution of behavior disorders: Infancy to early adult life.* New York: Brunner & Mazel.

Chisholm, R. M. (1966). Freedom and action. In K. Lehrer (Ed.), *Freedom and determinism* (pp. 11–44). New York: Random House.

Chudacoff, H. P. (1989). *How old are you? Age consciousness in American culture.* Princeton, NJ: Princeton University Press.

Clarke, A. M., & Clarke, A. D. B. (Eds.). (1976). *Early experience: Myth and evidence.* New York: Free Press.

Clarke-Stewart, K. A., & Fein, G. G. (1983). Early childhood programs. In M. M. Haith & J. J. Campos (Eds.), *Handbook of child psychology: Vol. 6. Infancy and developmental psychobiology* (pp. 917–999). New York: Wiley.

Cole, M. (Ed.). (1978). *Soviet developmental psychology: An anthology.* White Plains, NY: Sharp.

Cole, M., & Scribner, S. (1974). *Culture and thought: A psychological introduction.* New York: Wiley.

Coleman, J. C. (1980). *The nature of adolescence.* London: Methuen.

Coleman, J. C. (1986). *Aging and reminiscence processes: Social and clinical implications.* New York: Wiley.

Collins, R. L. (1996). For better or worse: The impact of upward social comparison on self-evaluations. *Psychological Bulletin, 119,* 51–69.

Coyne, J. C. (1992). Cognition on depression: A paradigm in crisis. *Psychological Inquiry, 3,* 232–235.

Crockett, L. J. (Ed.). (2002). *Nebraska Symposium on Motivation: Vol. 48. Agency, motivation, and the life course.* Lincoln: University of Nebraska Press.

Csikszentmihalyi, M., & Beattie, O. (1979). Life themes: A theoretical and empirical exploration of their origins and effects. *Journal of Humanistic Psychology, 19,* 45–63.

Csikszentmihalyi, M., & Rochberg-Halton, E. (1981). *The meaning of things: Domestic symbols and the self.* Cambridge, England: Cambridge University Press.

Damon, W., & Hart, D. (1982). The development of self-understanding from infancy through adolescence. *Child Development, 53,* 841–864.

D'Andrade, R. G. (1984). Cultural meaning systems. In R. A. Shweder & R. A. LeVine (Eds.), *Culture theory: Essays on mind, self, and emotion* (pp. 88–119). Cambridge, England: Cambridge University Press.

Dannefer, D. (1984). Adult development and social theory: A paradigmatic reappraisal. *American Sociological Review, 49,* 100–116.

Dannefer, D. (1989). Human action and its place in theories of aging. *Journal of Aging Studies, 3,* 1–20.

Dannefer, D., & Perlmutter, M. (1990). Development as a multidimensional process: Individual and social constituents. *Human Development, 33,* 108–137.

Davidson, D. (1980). *Essays on actions and events.* Oxford, England: Clarendon Press.

Dennett, D. C. (1987). *The intentional stance.* Cambridge, MA: MIT Press.

Derryberry, D. (1993). Attentional consequences of outcome-related motivational states: Congruent, incongruent, and focusing effects. *Motivation and Emotion, 17,* 65–89.

Diaz, R. M., Neal, L. J., & Amaya-Williams, M. (1991). The social origins of self-regulation. In L. Moll (Ed.), *Vygotsky and education* (pp. 127–154). London: Cambridge University Press.

Dilthey, W. (1924). Ideen über eine beschreibende und zergliedernde Psychologie. In B. Groethuysen (Ed.), *Wilhelm Diltey: Vol. V. Gesammelte Schriften* (pp. 139–240). Leipzig, Germany: Teubner.

Dittmann-Kohli, F. (1986). Problem identification and definition as important aspects of adolescents' coping with normative life-tasks. In R. K. Silbereisen, K. Eyferth, & G. Rudinger (Eds.), *Development as action in context* (pp. 19–38). Berlin, Germany: Springer.

Dixon, R. A., & Bäckman, L. (Eds.). (1995). *Compensating for psychological deficits and declines: Managing losses and promoting gains.* Hillsdale, NJ: Erlbaum.

Dörner, O. (1984). Denken und Handeln in Unbestimmtheit und Komplexität. In P. Wapnewski (Ed.), *Wissenschaftskolleg zu Berlin: Jahrbuch 1982/1983* (pp. 97–118). Berlin, Germany: Siedler.

Dreher, E., & Oerter, R. (1986). Children's and adolescents' conceptions of adulthood: The changing view of a crucial developmental task. In R. K. Silbereisen, K. Eyferth, & G. Rudinger (Eds.), *Development as action in context* (pp. 109–120). Berlin, Germany: Springer.

Dreher, M., & Oerter, R. (1987). Action planning competencies during adolescence and early adulthood. In S. L. Friedman, E. K. Scholnick, & R. R. Cocking (Eds.), *Blueprints for thinking: The role of planning in cognitive development* (pp. 321–355). Cambridge, MA: Cambridge University Press.

Duval, S., & Wicklund, R. A. (1972). *A theory of objective self-awareness.* New York: Academic Press.

Eckensberger, L. H., & Meacham, J. A. (1984). The essentials of action theory: A framework for discussion. *Human Development, 27,* 166–172.

Eckensberger, L. H., & Reinshagen, H. (1980). Kohlbergs Strukturtheorie der Entwicklung des moralischen Urteils: Ein Versuch ihrer Reinterpretation in Bezugsräumen handlungstheoretischer Konzepte. In L. H. Eckensberger & R. K. Silbereisen (Eds.), *Entwicklung sozialer Kognitionen* (pp. 65–131). Stuttgart, Germany: Klett-Cotta.

Edelstein, W., & Keller, M. (Eds.). (1982). *Perspektivität und Integration: Beiträge zur Entwicklung des sozialen Verstehens.* Frankfurt-am-Main, Germany: Suhrkamp.

Ellis, A. (1976). RET abolishes most of the human ego. *Psychotherapy: Theory, research, and practice, 13,* 343–348.

Elster, J. (1983). *Sour grapes: Studies in the subversion of rationality.* Cambridge, England: Cambridge University Press.

Emde, R. N., & Harmon, R. J. (Eds.). (1984). *Continuities and discontinuities in development.* New York: Plenum Press.

Emmons, R. A. (1986). Personal strivings: An approach to personality and subjective well-being. *Journal of Personality and Social Psychology, 51,* 1058–1068.

Emmons, R. A. (1989). The personal striving approach to personality. In L. A. Pervin (Ed.), *Goal concepts in personality and social psychology* (pp. 87–126). Hillsdale, NJ: Erlbaum.

Emmons, R. A. (1992). Abstract versus concrete goals: Personal striving level, physical illness, and psychological well-being. *Journal of Personality and Social Psychology, 62,* 292–300.

Epstein, S. (1973). The self-concept revisited or a theory of a theory. *American Psychologist, 28,* 405–416.

Ericsson, K. A. (1990). Peak performance and age: An examination of peak performance in sports. In P. B. Baltes & M. M. Baltes (Eds.), *Successful aging: Perspectives from the behavioral sciences* (pp. 154–196). New York: Cambridge University Press.

Erikson, E. H. (1959). Identity and the life cycle. *Psychological Issues, 1,* 18–164.

Feather, N. T. (Ed.). (1982). *Expectations and actions: Expectancy-value models in psychology.* Hillsdale, NJ: Erlbaum.

Felser, G., Schmitz, U., & Brandtstädter, J. (1998). Stabilität und Qualität von Partnerschaften: Risiken und Ressourcen. In K. Hahlweg, D. H. Baucom, R. Bastine, & H. J. Markman (Eds.), *Prävention von Trennung und Scheidung: Internationale Ansätze zur Prädiktion und Prävention von Beziehungsstörungen* (pp. 83–103). Stuttgart, Germany: Kohlhammer.

Fenigstein, A., Scheier, M. F., & Buss, A. H. (1975). Public and private self-consciousness: Assessment and theory. *Journal of Consulting and Clinical Psychology, 43,* 522–527.

Festinger, L. (1957). *A theory of cognitive dissonance.* Standford, CA: Standford University Press.

Filipp, S.-H. (1980). Entwicklung von Selbstkonzepten. *Zeitschrift für Entwicklungspsychologie und Pädagogische Psychologie, 12,* 105–125.

Filipp, S.-H., & Klauer, T. (1985). Conceptions of self over the life span: Reflections on the dialectics of change. In M. M. Baltes & P. B. Baltes (Eds.), *The psychology of aging and control* (pp. 167–205). Hillsdale, NJ: Erlbaum.

Fillmore, C. J. (1968). The case for case. In E. Bach & R. T. Harms (Eds.), *Universals in linguistic theory* (pp. 1–88). New York: Holt, Rinehart and Winston.

Fischer, K. W. (1980). A theory of cognitive development: The control and construction of a hierarchy of skills. *Psychological Review, 87,* 477–531.

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to theory and research.* Reading, MA: Addison-Wesley.

Flavell, J. H. (1972). An analysis of cognitive-developmental sequences. *Genetic Psychology Monographs, 86,* 279–350.

Flavell, J. H. (1977). *Cognitive development.* Englewood Cliffs, NJ: Prentice-Hall.

Flavell, J. H., Speer, J. R., Green, F. L., & August, D. L. (1981). The development of comprehension monitoring and knowledge about communication. *Monographs of the Society for Research in Child Development, 46*(Serial No. 192).

Flavell, J. H., & Wellman, H. M. (1977). Metamemory. In R. V. Kail Jr. & J. W. Hagen (Eds.), *Perspectives on the development of memory and cognition* (pp. 3–33). Hillsdale, NJ: Erlbaum.

Folkman, S. (1984). Personal control and stress and coping processes: A theoretical analysis. *Journal of Personality and Social Psychology, 46,* 839–852.

Ford, D. H. (1987). *Humans as self-constructing living systems: A developmental perspective on personality and behavior.* Hillsdale, NJ: Erlbaum.

Ford, D. H., & Lerner, R. M. (1992). *Developmental systems theory: An integrative approach.* Newbury Park, CA: Sage.

Frankfurt, H. G. (1971). Freedom of the will and the concept of a person. *Journal of Philosophy, 68,* 5–20.

Frese, M., & Sabini, J. (Eds.). (1985). *Goal-directed behavior: Psychological theory and research on action.* Hillsdale, NJ: Erlbaum.

Friedman, S. L., Scholnick, E. K., & Cocking, R. R. (Eds.). (1987). *Blueprints for thinking: The role of planning in cognitive development.* Cambridge, England: Cambridge University Press.

Frijda, N. H. (1986). *The emotions.* Cambridge, England: Cambridge University Press.

Fung, H. H., Abeles, R. P., & Carstensen, L. L. (1999). Psychological control in later life: Implications for life-span development. In J. Brandtstädter & R. M. Lerner (Eds.), *Action and self-development: Theory and research through the life span* (pp. 234–372). Thousand Oaks, CA: Sage.

Gärling, T., & Valsiner, J. (Eds.). (1985). *Children within environments: Toward a psychology of accident prevention.* New York: Plenum Press.

Geertz, C. (1973). *The interpretation of cultures: Selected essays.* New York: Basic Books.

Gehlen, A. (1988). *Man, his nature and place in the world.* New York: Columbia University Press. (Original work published 1955 in German)

Geppert, U., & Küster, U. (1983). The emergence of "wanting to do it oneself": A precursor of achievement motivation. *International Journal of Behavioral Development, 6,* 355–369.

Gergen, K. J. (1980). The emerging crisis in life-span developmental theory. In P. B. Baltes & O. G. Brim Jr. (Eds.), *Life-span development and behavior* (Vol. 3, pp. 31–63). New York: Academic Press.

Gergen, K. J., & Gergen, M. M. (1987). The self in temporal perspective. In R. P. Abeles (Ed.), *Life-span perspectives and social psychology* (pp. 121–137). Hillsdale, NJ: Erlbaum.

Gibson, J. J. (1977). The theory of affordances. In R. Shaw & F. Bransford (Eds.), *Perceiving, acting, and knowing* (pp. 67–82). Hillsdale, NJ: Erlbaum.

Giddens, A. (1979). *Control problems in social theory: Action, structure and contradiction in social theory.* London: Macmillan.

Gilbert, D. T. (1993). The assent of man: Mental representation and the control of belief. In D. M. Wegner & J. W. Pennebaker (Eds.), *Handbook of mental control* (pp. 57–87). Englewood Cliffs, NJ: Prentice-Hall.

Goldman, A. I. (1970). *A theory of human action.* Englewood Cliffs, NJ: Prentice-Hall.

Gollin, E. S. (1981). Development and plasticity. In E. S. Gollin (Ed.), *Developmental plasticity: Behavioral and biological aspects of variations in development* (pp. 231–251). New York: Academic Press.

Gollwitzer, P. M. (1987). Suchen, Finden und Festigen der eigenen Identität: Unstillbare Zielintentionen. In H. Heckhausen, P. M. Gollwitzer, & F. E. Weinert (Eds.), *Jenseits des Rubikon: der Wille in den Sozialwissenschaften* (pp. 176–189). Berlin, Germany: Springer.

Gollwitzer, P. M. (1990). Action phases and mind-sets. In E. T. Higgins & R. M. Sorrentino (Eds.), *Handbook of motivation and cognition: Vol. 2. Foundations of social behavior* (pp. 53–92). New York: Guilford Press.

Gollwitzer, P. M., & Bargh, J. A. (Eds.). (1996). *The psychology of action: Linking cognition and motivation to behavior.* New York: Guilford Press.

Gollwitzer, P. M., Bayer, U., Scherer, M., & Seifert, A. E. (1999). A motivational-volitional perspective on identity development. In J. Brandtstädter & R. M. Lerner (Eds.), *Action and self-development: Theory and research through the life span* (pp. 283–314). Thousand Oaks, CA: Sage.

Gollwitzer, P. M., & Moskowitz, G. B. (1996). Goal effects on action and cognition. In E. T. Higgings & A. W. Kruglanski (Eds.), *Social psychology: Handbook of basic principles* (pp. 361–399). New York: Guilford Press.

Goodnow, J. J., & Collins, W. A. (1990). *Development according to parents: The nature, sources, and consequences of parents' ideas.* Hillsdale, NJ: Erlbaum.

Gottlieb, G. (1992). *Individual development and evolution: The genesis of novel behavior.* New York: Oxford University Press.

Gould, S. J. (1977). *Ontogeny and phylogeny.* Cambridge, MA: Belknap.

Gould, S. J. (1981). *The mismeasure of man.* New York: Norton.

Greenwald, A. G. (1980). The totalitarian ego: Fabrication and revision of personal history. *American Psychologist, 35,* 603–618.

Greve, W. (1990). Stabilisierung und Modifikation des Selbstkonzeptes im Erwachsenenalter: Strategien der Immunisierung. *Sprache and Kognition, 9,* 218–230.

Greve, W. (1994). *Handlungsklärung.* Göttingen, Germany: Hogrefe.

Groeben, N. (1986). *Handeln, Tun, Verhalten als Einheiten einer verstehend-erklärenden Psychologie.* Tübingen, Germany: Francke.

Guardo, C. J., & Bohan, J. B. (1971). Development of a sense of self-identification in children. *Child Development, 42,* 1909–1921.

Gunnar, M. R. (1980). Contingent stimulation: A review of its role in early development. In S. Levine & H. Ursin (Eds.), *Coping and health* (pp. 101–119). New York: Plenum Press.

Hagestad, G. O. (1991). Trends and dilemmas in life course research: An international perspective. In W. R. Heinz (Ed.), *Theoretical advances in life course research* (pp. 23–57). Weinheim, Germany: Deutscher Studien Verlag.

Harackiewicz, J. M., & Sansone, L. (1991). Goals and intrinsic motivation: You *can* get there from here. In M. L. Maehr & P. R. Pintrich (Eds.), *Advances in motivation and achievement* (Vol. 7, pp. 21–49). Greenwich, CT: JAI Press.

Harré, R., & Secord, P. F. (1972). *The explanation of social behavior.* Oxford, England: Blackwell.

Harter, S. (1978). Effectance motivation reconsidered: Toward a developmental model. *Human Development, 1,* 34–64.

Harter, S. (1983). Developmental perspectives on the self-system. In E. M. Hetherington (Ed.), *Handbook of child psychology: Vol. IV. Socialization, personality, and social development* (pp. 275–385). New York: Wiley.

Harter, S. (1986). Cognitive-developmental processes in the integration of concepts about emotions and the self. *Social Cognition, 4,* 119–151.

Havighurst, R. J. (1974). *Developmental tasks and education* (3rd ed.). New York: McKay. (Original work published 1948)

Hayek, F. A. (1979). *Law, legislation and liberty: Vol. 3. The political order of a free people.* London: Routledge & Kegan Paul.

Hayes-Roth, B., & Hayes-Roth, F. (1979). A cognitive model of planning. *Cognitive Science, 3,* 275–310.

Heckhausen, H. (1984). Emergent achievement behavior: Some early developments. In J. Nicholls (Ed.), *Advances in motivation and achievement: Vol. 3. The development of achievement motivation* (pp. 1–32). Greenwich, CT: JAI Press.

Heckhausen, H. (1989). *Motivation und Handeln* (2nd ed.). Berlin, Germany: Springer.

Heckhausen, H., & Gollwitzer, P. M. (1987). Thought contents and cognitive functioning in motivational versus volitional states of mind. *Motivation and Emotion, 11*(2), 101–120.

Heckhausen, J. (1999). *Developmental regulation in adulthood: Age-normative and sociocultural constraints as adaptive challenges.* New York: Cambridge University Press.

Heckhausen, J., & Baltes, P. B. (1991). Perceived controllability of expected psychological change across adulthood and old age. *Journal of Gerontology: Psychological Sciences, 46,* 165–173.

Heckhausen, J., Dixon, R. A., & Baltes, P. B. (1989). Gains and losses in development throughout adulthood as perceived by different adult age groups. *Developmental Psychology, 25,* 109–121.

Heckhausen, J., & Dweck, C. S. (Eds.). (1998). *Motivation and self-regulation across the life span.* New York: Cambridge University Press.

Heckhausen, J., & Krueger, J. (1993). Developmental expectations for the self and "most other people": Age-grading in three functions of social comparison. *Developmental Psychology, 29,* 539–548.

Heckhausen, J., & Schulz, R. (1995). A life-span theory of control. *Psychological Review, 102,* 284–304.

Hegel, G. W. F. (1857). *Lectures of the philosophy of history* (J. Sibree, Trans., 3rd German ed.). London: Bohn. (Original work published 1837 in German)

Heidmets, M. (1985). Environment as the mediator of human relationships: Historical and ontogenetic aspects. In T. Gärling & J. Valsiner (Eds.), *Children within environments: Toward a psychology of accident prevention* (pp. 217–227). New York: Plenum Press.

Herder, J. G. (1772). *Abhandlung über den Ursprung der Sprache.* Berlin, Germany: A. Weichert.

Higgins, E. T. (1988). Development of self-regulatory and self-evaluative processes: Costs, benefits, and trade-offs. In M. R. Gunnar & L. A. Sroufe (Eds.), *Minnesota Symposium on Child Psychology: Vol. 23. Self processes in development* (pp. 125–165). Minneapolis: University of Minnesota Press.

Higgins, E. T., Klein, R., & Strauman, T. (1985). Self-concept discrepancy theory: A psychological model for distinguishing among different aspects of depression and anxiety. *Social Cognition, 3,* 51–76.

Higgins, E. T., Strauman, T., & Klein, R. (1986). Standards and the process of self-evaluation: Multiple affects from multiple stages. In R. M. Sorrentino & E. T. Higgins (Eds.), *Handbook of motivation and cognition: Foundations of social behavior* (pp. 23–63). New York: Guilford Press.

Höhn, E. (1958). Entwicklung als aktive Gestaltung. In H. Thomae (Ed.), *Entwicklungspsychologie* (pp. 312–235). Göttingen, Germany: Hogrefe.

Ickes, W. (Ed.). (1985). *Compatible and incompatible relationships.* New York: Springer.

Inhelder, B., & Piaget, J. (1958). *The growth of logical thinking form childhood to adolescence.* New York: Basic Books.

Inhelder, B., & Piaget, J. (1964). *The early growth of logic in the child.* New York: Norton.

James, W. (1890). *The principles of psychology.* New York: Holt.

Janoff-Bulman, R., & Brickman, P. (1982). Expectations and what people learn from failure. In N. T. Feather (Ed.), *Expectations and actions* (pp. 207–237). Hillsdale, NJ: Erlbaum.

Kagan, J. (1971). *Change and continuity in infancy.* New York: Wiley.

Kagan, J. (1981a). *The second year: The emergence of self-awareness.* Cambridge, MA: Harvard University Press.

Kagan, J. (1981b). Universals in human development. In R. H. Munroe, R. L. Munroe, & B. B. Whiting (Eds.), *Handbook of cross-cultural human development* (pp. 53–63). New York: Garland STPM Press.

Kagan, J. (1984). *The nature of the child.* New York: Basic Books.

Kagan, J., & Moss, H. A. (1962). *Birth to maturity.* New York: Wiley.

Kahana, E., Kahana, B., & Riley, K. (1989). Person-environment transactions relevant to control and helplessness in institutional settings. In P. S. Fry (Ed.), *Psychological perspectives of helplessness and control in the elderly* (pp. 121–153). Amsterdam: Elsevier.

Kahneman, D., & Miller, D. T. (1986). Norm theory: Comparing reality to its alternatives. *Psychological Review, 93,* 136–153.

Kalicki, B. (1996). *Lebensverläufe und Selbstbilder: Die Normalbiographie als psychologisches Regulativ.* Opladen, Germany: Leske & Budrich.

Kaminski, G. (1982). What beginner skiers can teach us about actions. In M. von Cranach & R. Harré (Eds.), *The analysis of action* (pp. 99–114). Cambridge, England: Cambridge University Press.

Kamlah, W. (1973). *Philosophische Anthropologie: Sprachkritische Grundlegung und Ethik.* Mannheim, Germany: BI Taschenbücher.

Kanfer, F. H., & Hagerman, S. (1981). The role of self-regulation. In L. P. Rehm (Ed.), *Behavior therapy for depression: Present status and future directions* (pp. 143–180). New York: Academic Press.

Karoly, P. (1993). Mechanisms of self-regulation: A systems view. *Annual Review of Psychology, 44,* 23–52.

Kastenbaum, R. (1982). Time course and time perspective in later life. In C. Eisdorfer (Ed.), *Annual review of geriatrics and gerontology* (pp. 80–101). New York: Springer.

Kegan, R. (1983). A neo-Piagetian approach to object relations. In B. Lec & G. G. Noam (Eds.), *Developmental approaches to the self* (pp. 267–307). New York: Plenum Press.

Keil, F. C. (1979). *Semantic and conceptual development: An ontological perspective.* Cambridge, MA: Harvard University Press.

Keil, F. C. (1989). *Concepts, kinds, and cognitive development.* Cambridge, MA: Bradford Books.

Keil, F. C., & Batterman, N. (1984). A characteristic-to-defining shift in the development of word meaning. *Journal of Verbal Learning and Verbal Behavior, 23,* 211–236.

Kesselring, F. (1981). *Entwicklung und Widerspruch.* Frankfurt-am-Main, Germany: Suhrkamp.

Kessler, R. C., Foster, C., Webster, P. S., & House, J. S. (1992). The relationship between age and depressive symptoms in two national surveys. *Psychology and Aging, 7,* 119–126.

Kihlstrom, J. F., & Cantor, N. (1984). Mental representations of the self. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 17, pp. 1–47). New York: Academic Press.

Kliegl, R., Smith, J., & Baltes, P. B. (1989). Testing-the-limits and the study of age differences in cognitive plasticity of a mnemonic skill. *Developmental Psychology, 26,* 894–904.

Klinger, E. (1975). Consequences of commitment to and disengagement from incentives. *Psychological Review, 82,* 1–25.

Klinger, E. (1987). Current concerns and disengagement from incentives. In F. Halisch & J. Kuhl (Eds.), *Motivation, intention, and volition* (pp. 337–347). Berlin, Germany: Springer.

Kohlberg, L. (1966). A cognitive-developmental analysis of children's sex-role concepts and attitudes. In E. E. Maccoby (Ed.), *The development of sex differences* (pp. 82–172). Stanford, CA: Stanford University Press.

Kohlberg, L. (1976). Moral stages and moralization: The cognitive developmental approach. In T. Lickona (Ed.), *Moral development and behavior: Theory, research, and social issues* (pp. 31–53). New York: Holt, Rinehart and Winston.

Kohlberg, L., LaCrosse, J., & Ricks, D. (1972). The predictability of adult mental health from childhood behavior. In B. Wolman (Ed.), *Manual of child psychopathology* (pp. 1217–1284). New York: McGraw-Hill.

Kopp, C. B. (1982). Antecedents of self-regulation: A developmental perspective. *Developmental Psychology, 18,* 199–214.

Kopp, C. B. (1987). The growth of self-regulation: Caregivers and children. In N. Eisenberg (Ed.), *Contemporary topics in developmental psychology* (pp. 34–55). New York: Wiley.

Kopp, C. B. (1989). Regulation of distress and negative emotions: A developmental view. *Developmental Psychology, 25,* 343–354.

Krampen, G. (1987a). *Handlungstheoretische Persönlichkeitspsychologie.* Göttingen, Germany: Hogrefe.

Krampen, G. (1987b). Entwicklung von Kontrollüberzeugungen: Thesen zu Forschungsstand and Perspektiven. *Zeitschrift für Entwicklungspsychologie und Pädagogische Psychologie, 19,* 195–227.

Kruglanski, A. W. (1990). Lay epistemic theory in social-cognitive psychology. *Psychological Inquiry, 1,* 181–197.

Kruglanski, A. W. (1996). Goals as knowledge structures. In P. M. Gollwitzer & J. A. Bargh (Eds.), *The psychology of action: Linking cognition and motivation to behavior* (pp. 599–618). New York: Guilford Press.

Kuhl, J., & Beckmann, J. (Eds.). (1985). *Action control: From cognition to behavior.* Berlin, Germany: Springer.

Kuhl, J., & Beckmann, J. (Eds.). (1994). *Volition and personality.* Göttingen, Germany: Hogrefe.

Kukla, A. (1989). Nonempirical issues in psychology. *American Psychologist, 44,* 785–794.

Kunda, Z. (1990). The case for motivated reasoning. *Psychological Bulletin, 108,* 480–498.

Lachman, M. E. (1986). Locus of control in aging research: A case for multidimensional and domain-specific assessment. *Journal of Psychology and Aging, 1,* 34–40.

Lamb, M. E., & Easterbrooks, M. A. (1981). Individual differences in parental sensitivity: Some thoughts about origins, components, and consequences. In M. E. Lamb & R. L. Sherrod (Eds.), *Infant social cognition: Empirical and theoretical considerations* (pp. 127–153). Hillsdale, NJ: Erlbaum.

Lanz, P. (1987). *Menschliches Handeln zwischen Kausalität und Rationalität.* Frankfurt-am-Main, Germany: Athenäum.

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation.* New York: Cambridge University Press.

Lawrence, J. A., & Valsiner, J. (1993). Conceptual roots of internalization: From transmission to transformation. *Human Development, 36,* 150–167.

Lazarus, R. S., & Launier, R. (1978). Stress-related transactions between person and environment. In L. A. Pervin & M. Lewis (Eds.), *Perspectives in interactional psychology* (pp. 287–327). New York: Plenum Press.

Lazarus, R. S., & Smith, C. A. (1988). Knowledge and appraisal in the cognition-emotion relationship. *Cognition and Emotion, 2,* 281–300.

Lee, B., Wertsch, J. V., & Stone, A. (1983). Toward a Vygotskyan theory of the self. In B. Lee & G. G. Noam (Eds.), *Developmental approaches to the self* (pp. 309–341). New York: Plenum Press.

Lenk, H. (1978). *Handlungstheorien: Interdisziplinär: Vol. II. Handlungserklärungen und philosophische Handlungsinterpretation.* München, Germany: Fink.

Lenk, H. (1981). Interpretative action constructs. In J. Agassi & R. S. Cohen (Eds.), *Scientific philosophy today* (pp. 151–157). Dordrecht, The Netherlands: Reidel.

Lenk, H. (1987). Strukturelle und empirische Implikationen: Über einige strukturinduzierte Implikationen und deren Umkehrungen in der Soziometrie und Sozialpsychologie. In J. Brandtstädter (Ed.), *Struktur und Erfahrung in der psychologischen Forschung* (pp. 14–34). Berlin, Germany: W. de Gruyter.

Leont'ev, A. N. (1978). *Activity, consciousness, and personality.* Englewood Cliffs, NJ: Prentice-Hall.

Lerner, R. M. (1982). Children and adolescents as producers of their own development. *Developmental Review, 2,* 342–370.

Lerner, R. M. (1984). *On the nature of human plasticity.* Cambridge, England: Cambridge University Press.

Lerner, R. M. (1985). Individual and context in developmental psychology: Conceptual and theoretical issues. In J. R. Nesselroade & A. von Eye (Eds.), *Individual development and social change: Explanatory analysis* (pp. 155–188). New York: Academic Press.

Lerner, R. M. (2002). *Concepts and theories of human development* (3rd ed.). Mahwah, NJ: Erlbaum.

Lerner, R. M., & Busch-Rossnagel, A. (Eds.). (1981). *Individuals as producers of their development: A life-span perspective.* New York: Academic Press.

Lerner, R. M., & Lerner, J. V. (1983). Temperament-intelligence reciprocities in early childhood: A contextual model. In M. Lewis (Ed.), *Origins of intelligence: Infancy and early childhood* (2nd ed., pp. 399–421). New York: Plenum Press.

Lerner, R. M., & von Eye, A. (1992). Sociobiology and human development: Arguments and evidence. *Human Development, 35,* 12–33.

Levinson, D. J. (1978). *The seasons of a man's life.* New York: Alfred Knopf.

Lewis, M. (1991). Ways of knowing: Objective self-awareness or consciousness. *Developmental Review, 11,* 231–243.

Lewis, M., & Brooks-Gunn, J. (1979). *Social cognition and the acquisition of self.* New York: Plenum Press.

Lewontin, R. C. (1982). Organism and environment. In H. C. Plotkin (Ed.), *Learning, development and culture* (pp. 151–170). Chichester, England: Wiley.

Linville, P. W. (1987). Self-complexity as a cognitive buffer against stress-related illness and depression. *Journal of Personality and Social Psychology, 52,* 663–676.

Little, B. R. (1983). Personal projects: A rationale and method for investigation. *Environment and Behavior, 15,* 273–309.

Little, B. R. (1989). Personal projects analyses: Trivial pursuits, magnificent obsessions and the search for coherence. In D. M. Buss & N. Cantor (Eds.), *Personality psychology: Recent trends and emerging directions* (pp. 15–31). New York: Springer.

Little, B. R. (1998). Personal project pursuit: Dimensions and dynamics of personal meaning. In P. T. P. Wong & P. S. Fry (Eds.), *The human quest for meaning: A handbook of research and clinical applications* (pp. 193–235). Mahwah, NJ: Erlbaum.

Locke, E. A., & Latham, G. P. (1990). *A theory of goal setting and task performance.* Englewood Cliffs, NJ: Prentice-Hall.

Luria, A. R. (1969). Speech development and the formation of mental processes. In M. Cole & I. Maltzman (Eds.), *A handbook of contemporary Soviet psychology* (pp. 121–162). New York: Basic Books.

Luria, A. R. (1979). *The making of mind.* Cambridge, MA: Harvard University Press.

Lütkenhaus, P., & Bullock, M. (1991). The development of volitional skills. In M. Bullock (Ed.), *The development of intentional action: Cognitive, motivational, and interactive processes* (Contributions to Human Development, Vol. 22, pp. 14–23). Basel, Switzerland: Karger.

Mace, F. C., Belfiore, P. J., & Shea, M. C. (1989). Operant theory and research on self-regulation. In B. J. Zimmerman & D. H. Schunk

(Eds.), *Self-regulated learning and academic achievement: Theory, research, and practice* (pp. 27–50). New York: Springer.

Magnusson, D. (1990). Personality development from an interactional perspective. In L. A. Pervin (Ed.), *Handbook of personality: Theory and research* (pp. 193–222). New York: Guilford Press.

Marcus, D. E., & Overton, W. F. (1978). The development of cognitive gender constancy and sex role preferences. *Child Development, 49,* 434–444.

Markman, E. (1977). Realizing that you don't understand: A preliminary investigation. *Child Development, 48,* 986–992.

Markus, H. (1977). Self-schemata and processing information about the self. *Journal of Personality and Social Psychology, 35,* 63–78.

Martin, L. L., & Tesser, A. (1989). Toward a motivational and structural theory of ruminative thought. In J. S. Uleman & J. A. Bargh (Eds.), *Unintended thought* (pp. 306–326). New York: Guilford Press.

Martin, L. L., Tesser, A., & McIntosh, W. D. (1993). Wanting but not having: The effects of unattained goals on thoughts and feelings. In D. M. Wegner & J. W. Pennebaker (Eds.), *The handbook of mental control* (pp. 552–572). New York: Prentice-Hall.

Mascolo, M. F., Fischer, K. W., & Neimeyer, R. (1999). The dynamic of co-development of intentionality, self, and social relations. In J. Brandtstädter & R. M. Lerner (Eds.), *Action and self-development: Theory and research through the life span* (pp. 133–166). Thousand Oaks, CA: Sage.

Maturana, H., & Varela, F. (1980). *Autopoiesis and cognition: The realization of the living.* Boston: D. Riedel.

McCall, R. B. (1981). Nature-nuture and the two realms of development: A proposed integration with respect to mental development. *Child Development, 52,* 1–12.

McGuire, W. J., & McGuire, C. U. (1981). The spontaneous self-concept as affected by personal distinctiveness. In M. D. Lynch, A. A. Norem-Hebeisen, & K. J. Gergen (Eds.), *Self-concept: Advances in theory and research* (pp. 147–172). Cambridge, MA: Ballinger.

Medin, D. L., & Smith, E. E. (1984). Concepts and concept formation. *Annual Review of Psychology, 35,* 113–138.

Mees, U. (1991). *Die Struktur der Emotionen.* Göttingen, Germany: Hogrefe.

Meyer, J. S., & Rebok, G. W. (1985). Planning-in-action across the life span. In T. M. Schlecter & M. P. Toglia (Eds.), *New directions in cognitive science* (pp. 47–68). Norwood, NJ: Ablex.

Miller, D. T., Turnbull, W., & McFarland, C. (1990). Counterfactual thinking and social perception: Thinking about what might have been. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 23, pp. 305–331). New York: Academic Press.

Miller, G. A., Galanter, E., & Pribram, K. H. (1960). *Plans and the structure of behavior.* New York: Holt, Rinehart and Winston.

Miller, P. H., & Bigi, L. (1979). The development of children's understanding of attention. *Merrill-Palmer Quarterly, 25,* 235–263.

Mischel, T. (1969). Human action: Conceptual and empirical issues. In T. Mischel (Ed.), *Human action: Conceptual and empirical issues* (pp. 261–278). New York: Academic Press.

Mischel, W. (1983). Delay of gratification as process and as person variable in development. In D. Magnusson & U. P. Allen (Eds.), *Human development: An interactional perspective* (pp. 149–165). New York: Academic Press.

Mischel, W., Cantor, N., & Feldman, S. (1996). Principles of self-regulation: The nature of will-power and self-control. In E. T. Higgins & A. W. Kruglanski (Eds.), *Social psychology: Handbook of basic principles* (pp. 329–360). New York: Guilford Press.

Mischel, W., & Mischel, H. N. (1976). A cognitive social-learning approach to morality and self-regulation. In T. Lickona (Ed.), *Moral development and behavior* (pp. 84–107). New York: Holt, Rinehart and Winston.

Miskimins, R. W., & Simmons, W. L. (1966). Goal preference as a variable in involutional psychosis. *Journal of Consulting and Clinical Psychology, 30,* 73–77.

Montada, L. (1992). Attribution of responsibility for losses and perceived injustice. In L. Montada, S.-H. Filipp, & M. Lerner (Eds.), *Life crises and experiences of loss in adulthood* (pp. 133–161). Hillsdale, NJ: Erlbaum.

Moya, C. J. (1990). *The philosophy of action.* Cambridge, England: Polity Press.

Müller, A. W. (1982). *Praktisches Folgern und Selbstgestaltung nach Aristoteles.* Freiburg, Germany: Alber.

Nagel, E. (1957). Determinism and development. In D. B. Harris (Ed.), *The concept of development* (pp. 15–24). Minneapolis: University of Minnesota Press.

Neugarten, B. L., & Hagestad, G. O. (1976). Age and the life course. In R. H. Binstock & E. Shanas (Eds.), *Handbook of aging and the social sciences* (pp. 35–57). New York: Van Nostrand.

Newmann, J. B. (1989). Aging and depression. *Psychology and Aging, 4,* 150–165.

Nicholls, J. G., & Miller, A. T. (1984). Development and its discontents: The differentiation of the concept of ability. In J. G. Nicholls (Ed.), *Advances in motivation and achievement: Vol. 3. The development of achievement motivation* (pp. 185–218). Greenwich, CT: JAI Press.

Nicholls, J. G., & Miller, A. T. (1985). Differentiation of the concepts of luck and skill. *Developmental Psychology, 21,* 76–82.

Nisbett, R., & Ross, L. (1980). *Human inference: Strategies and shortcomings of social judgment.* Englewood Cliffs, NJ: Prentice-Hall.

Norem-Hebeisen, A. A. (1981). A maximization model of self-concept. In M. D. Lynch, A. A. Norem-Hebeisen, & K. J. Gergen (Eds.), *Self-concept: Advances in theory and research* (pp. 133–146). Cambridge, MA: Ballinger.

Nozick, R. (1989). *The examined life: Philosophical meditations.* New York: Simon & Schuster.

Nurmi, J.-E. (1992). Age differences in adult life goals, concerns, and their temporal extension: A life course approach to future-oriented motivation. *International Journal of Behavioral Development, 15,* 487–508.

Nurmi, J.-E. (1993). Adolescent development in an age-graded context: The role of personal beliefs, goals, and strategies in the tackling of developmental tasks and standards. *International Journal of Behavioral Development, 16,* 169–189.

Nuttin, J. R. (1984). *Motivation, planning, and action: A relational theory of behavior dynamics.* Hillsdale, NJ: Erlbaum.

Oerter, R. (1991). Self-object relation as a basis of human development. In L. Oppenheimer & J. Valsiner (Eds.), *The origins of action: Interdisciplinary and international perspectives* (pp. 65–100). New York: Springer.

Olson, G. M., & Sherman, T. (1983). Attention, learning, and memory in infants. In M. Haith & J. J. Campos (Eds.), *Handbook of child psychology: Vol. 2. Infancy and developmental psychobiology* (pp. 1001–1080). New York: Wiley.

Oppenheimer, L., & Valsiner, J. (Eds.). (1991). *The origins of action: Interdisciplinary and international perspectives.* New York: Springer.

Overton, W. F. (Ed.). (1990). *Reasoning, necessity, and logic: Developmental perspectives.* Hillsdale, NJ: Erlbaum.

Overton, W. F., & Reese, H. W. (1981). Conceptual prerequisites for an understanding of stability-change and continuity-discontinuity. *International Journal of Behavioral Development, 4,* 99–123.

Oyama, S. (1979). The concept of the sensitive period in developmental studies. *Merrill-Palmer Quarterly, 25,* 83–103.

Papousek, H., & Papousek, M. (1987). Intuitive parenting: A dialectic counterpart to the infant's integrative competence. In J. D. Osofsky (Ed.), *Handbook of infant development* (2nd ed., pp. 669–720). New York: Wiley.

Papousek, M., & Papousek, H. (1989). Stimmliche Kommunikation im frühen Säuglingsalter als Wegbereiter der Sprachentwicklung. In H. Keller (Ed.), *Handbuch der Kleinkindforschung* (pp. 465–489). Berlin, Germany: Springer.

Parasuraman, R., & Davies, D. R. (1984). *Varieties of attention.* New York: Academic Press.

Parkinson, B., & Manstead, A. S. R. (1992). Appraisal as a cause of emotion. In M. S. Clark (Ed.), *Emotion* (pp. 122–149). Newbury Park, CA: Sage.

Parsons, T., & Shils, E. A. (Eds.). (1962). *Toward a general theory of action* (2nd ed.). New York: Harper & Row.

Pennebaker, J. W. (1989). Stream of consciousness and stress: Levels of thinking. In J. S. Uleman & J. A. Bargh (Eds.), *Unintended thought* (pp. 327–349). New York: Guilford Press.

Pervin, L. A. (1991). Self-regulation and the problem of volition. In M. L. Maehr & P. R. Pintrich (Eds.), *Advances in motivation and achievement* (Vol. 7, pp. 1–20). Greenwich, CT: JAI Press.

Piaget, J. (1932). *The moral judgement of the child.* New York: Harcourt & Brace.

Piaget, J. (1952). *The origins of intelligence in children.* New York: International Universities Press. (Original work published 1936 in French)

Piaget, J. (1970). Piaget's theory. In P. H. Mussen (Ed.), *Carmichael's handbook of child psychology* (Vol. 1, pp. 703–732). New York: Wiley.

Piaget, J. (1976). *The grasp of consciousness: Action and concept in the young child.* Cambridge, MA: Harvard University Press.

Piaget, J. (1978). *Success and understanding.* Cambridge, MA: Harvard University Press.

Piaget, J. (1986). Essay on necessity. *Human Development, 29,* 301–314.

Piaget, J. (1987). *Possibility and necessity: Vol. 2. The role of necessity in cognitive development.* Minneapolis: University of Minnesota Press.

Piaget, J., & Garcia, R. (1991). *Toward a logic of meanings* (P. M. Davidson & J. Easley, Eds.). Hillsdale, NJ: Erlbaum. (Original work published 1983)

Piaget, J., & Inhelder, B. (1974). *The child's conception of quantities: Conservation and atomism.* London: Routledge & Kegan Paul. (Original work published 1942 in French).

Plomin, R. (1986). *Development, genetics and psychology.* Hillsdale, NJ: Erlbaum.

Popper, K. M. (1961). *The poverty of historicism.* London: Routledge & Kegan Paul.

Powers, W. T. (1973). *Behavior: The control of perception.* Chicago: Aldine.

Pulkkinen, L., Nurmi, J. E., & Kokko, K. (2002). Individual differences in personal goals in mid-thirties. In L. Pulkkinen & A. Caspi (Eds.), *Paths to successful development: Personality in the life course* (pp. 331–352). Cambridge, England: Cambridge University Press.

Putnam, H. (1975). *Philosophical papers: Vol. 2. Mind, language, and reality.* Cambridge, MA: Cambridge University Press.

Quine, W. V. O. (1951). Two dogmas of empiricism. *Philosophical Review, 60,* 2–43.

Rawls, J. (1971). *A theory of justice.* Cambridge, MA: Cambridge University Press.

Raynor, J. O. (1981). Future orientation and achievement motivation: Toward a theory of personality functioning and change. In G. D'Ydewalle & W. Lens (Eds.), *Cognition in human motivation and learning* (pp. 199–231). Leuven, Belgium: Leuven University Press.

Raynor, J. O. (1982). A theory of personality functioning and change. In J. O. Raynor & E. E. Entin (Eds.), *Motivation, career striving, and aging* (pp. 13–82). Washington, DC: Hemisphere.

Raynor, J. O., & Entin, E. E. (Eds.). (1982). *Motivation, career striving, and aging.* Washington, DC: Hemisphere.

Raynor, J. O., & Entin, E. E. (1983). The function of future orientation as a determinant of human behavior in step-path theory of action. *International Journal of Psychology, 18,* 436–487.

Reese, H. W., & Overton, W. F. (1970). Models of development and theories of development. In L. R. Goulet & P. B. Baltes (Eds.), *Life-span developmental psychology: Research and theory* (pp. 116–149). New York: Academic Press.

Reinert, G. (1976). Grundzüge einer Geschichte der Human-Entwicklungspsychologie. In H. Balmer (Ed.), *Die Psychologie des 20. Jahrhunderts: Bd. 1. Die europäische Tradition. Tendenzen, Schulen, Entwicklungslinien* (pp. 862–896). Zürich, Switzerland: Kindler.

Reisenzein, R., & Schönpflug, U. (1992). Stumpf's cognitive-evaluative theory of emotion. *American Psychologist, 47,* 34–45.

Resnick, L. R. (Ed.). (1973). Hierarchies in children's learning: A symposium. *Instructional Science, 2,* 311–362.

Rest, J. (1982). Morality. In J. H. Flavell & E. M. Markman (Eds.), *Handbook of child psychology: Vol. 3. Cognitive development* (pp. 556–630). New York: Wiley.

Ricco, R. B. (1993). Revising the logic of operations as a relevance logic: From hypothesis testing to explanation. *Human Development, 36,* 125–146.

Riegel, K. F. (1976). The dialectics of human development. *American Psychologist, 31,* 689–700.

Rodin, J. (1987). Personal control through the life course. In R. P. Abeles (Ed.), *Life-span perspective and social psychology* (pp. 103–119). Hillsdale, NJ: Erlbaum.

Rogoff, B. (1990). *Apprenticeship in thinking: Cognitive development in social context.* New York: Oxford University Press.

Rommetveit, R. (1980). On "meanings" of acts and what is meant and made known by what is said in a pluralistic social world. In M. Brenner (Ed.), *The structure of action* (pp. 108–149). Oxford, England: Blackwell.

Rosch, E. (1977). Human categorization. In N. Warren (Ed.), *Studies in cross-cultural psychology* (Vol. 1, pp. 1–49). New York: Academic Press.

Rosch, E. (1978). Principles of categorization. In E. Rosch & B. B. Lloyd (Eds.), *Cognition and categorization* (pp. 27–48). Hillsdale, NJ: Erlbaum.

Rosenberg, M. (1979). *Conceiving the self.* New York: Basic Books.

Rosenberg, M., & Rosenberg, F. (1981). The occupational self: A developmental study. In M. D. Lynch, A. A. Norem-Hebeisen, &

K. J. Gergen (Eds.), *Self-concept: Advances in theory and research* (pp. 173–189). Cambridge, MA: Ballinger.

Rothbaum, F., Weisz, J. R., & Snyder, S. S. (1982). Changing the world and changing the self: A two-process model of perceived control. *Journal of Personality and Social Psychology, 42,* 5–37.

Rothermund, K. (2003). Motivation and attention: Incongruent effects of feedback on the processing of valence. *Emotion, 3,* 223–238.

Rowe, J. W., & Kahn, R. L. (1987). Human aging: Usual and successful. *Science, 237,* 143–149.

Russell, G., & Smith, J. (1979). Girls can be doctors, can't they: Sex differences in career aspirations. *Australian Journal of Social Issues, 14,* 91–102.

Rutter, M. (1984). Continuities and discontinuities in socioemotional development: Empirical and conceptual perspectives. In R. N. Emde & R. J. Harmon (Eds.), *Continuities and discontinuities in development* (pp. 41–68). New York: Plenum Press.

Salthouse, T. A. (1987). Age, experience, and compensation. In K. Schooler & K. W. Schaie (Eds.), *Cognitive functioning and social structure over the life course* (pp. 142–150). Norwood, NJ: Ablex.

Sameroff, A. (1975). Transactional models in early social relations. *Human Development, 18,* 65–79.

Samuelson, P. A., & Nordhaus, W. D. (1985). *Economics* (12th ed.). New York: McGraw-Hill.

Scarr, S. (1982). On quantifying the intended effects of interventions: A proposed theory of the environment. In L. A. Bond & J. M. Joffe (Eds.), *Facilitating infant and early childhood development* (pp. 466–485). Hanover, NH: University Press of New England.

Scarr, S., & McCartney, K. (1983). How people make their own environments: A theory of genotype-environment effects. *Child Development, 54,* 424–435.

Schaie, K. W. (Ed.). (1983). *Longitudinal studies of adult psychological development.* New York: Guilford Press.

Schank, R. C., & Abelson, R. P. (1977). *Scripts, plans, goals and understanding: An inquiry into human knowledge structures.* Hillsdale, NJ: Erlbaum.

Schmitz, U., Saile, H., & Nilges, P. (1996). Coping with chronic pain: Flexible goal adjustment as an interactive buffer against pain-related distress. *Pain, 67,* 41–51.

Schneider, E. L., & Rowe, J. W. (Eds.). (1991). *Handbook of the biology of aging* (3rd ed.). San Diego, CA: Academic Press.

Schulz, R., & Decker, S. (1985). Long-term adjustment to physical disability: The role of social support, perceived control, and self-blame. *Journal of Personality and Social Psychology, 48,* 1162–1172.

Schunk, D. (1991). Goal-setting and self-evaluation: A social-cognitive perspective on self-regulation. In M. L. Maehr & P. R. Pintrich (Eds.), *Advances in motivation and achievement* (Vol. 7, pp. 85–113). Greenwich, CT: JAI Press.

Schütz, A. (1962). *Collected papers* (Vol. 1). Den Haag, The Netherlands: Martinus Nijhoff.

Searle, J. R. (1969). *Speech acts.* London: Cambridge University Press.

Seligman, M. E. P. (1990). Why is there so much depression today? The waxing of the individual and the waning of the commons. In R. E. Ingram (Ed.), *Contemporary psychological approaches to depression* (pp. 1–9). New York: Plenum Press.

Selman, R. (1980). *The growth of interpersonal understanding.* New York: Academic Press.

Selman, R., & Damon, W. (1975). The necessity (but insufficiency) of social perspective taking for conceptions of justice at three early levels. In D. J. DePalma & J. M. Foley (Eds.), *Moral development: Current theory and research* (pp. 57–74). Hillsdale, NJ: Erlbaum.

Shiffrin, R. M., & Dumais, S. T. (1981). The development of automatism. In J. R. Anderson (Ed.), *Cognitive skills and their acquisition* (pp. 111–140). Hillsdale, NJ: Erlbaum.

Shiffrin, R. M., & Schneider, W. (1977). Controlled and automatic human information processing: II. Perceptual learning, automatic attending, and a general theory. *Psychological Review, 84,* 127–190.

Shweder, R. A. (1990). Cultural psychology: What is it. In J. W. Stigler, R. A. Shweder, & G. Herdt (Eds.), *Cultural psychology: Essays on comparative human development* (pp. 1–43). Cambridge, England: Cambridge University Press.

Siegler, R. S. (1981). Developmental sequences within and between concepts. *Monographs of the Society for Research in Child Development, 46,* Serial No. 189.

Silbereisen, R. K., Eyferth, K., & Rudinger, G. (Eds.). (1987). *Development as action in context.* New York: Springer.

Simon, H. A. (1983). *Reason in human affairs.* Oxford, England: Basil Blackwell.

Skinner, B. F. (1953). *Science and human behavior.* New York: Macmillan.

Skinner, E. A. (1985). Action, control judgments, and the structure of control experience. *Psychological Review, 92,* 39–58.

Skinner, E. A. (1991). Development and perceived control: A dynamic model of action in context. In M. Gunnar & L. A. Sroufe (Eds.), *Minnesota Symposium on Child Psychology* (Vol. 22, pp. 167–216). Hillsdale, NJ: Erlbaum.

Skinner, E. A. (1995). *Perceived control, motivation, and coping.* Thousand Oaks, CA: Sage.

Skinner, E. A., Chapman, M., & Baltes, P. B. (1988). Control, means-ends, and agency beliefs: A new conceptualization and its measurement during childhood. *Journal of Personality and Social Psychology, 54,* 117–133.

Skinner, E. A., & Connell, J. P. (1986). Control understanding: Suggestions for a developmental framework. In M. M. Baltes & P. B. Baltes (Eds.), *The psychology of control and aging* (pp. 35–69). Hillsdale, NJ: Erlbaum.

Smedslund, J. (1979). Between the analytic and the arbitrary: A case study of psychological research. *Scandinavian Journal of Psychology, 20,* 129–140.

Smedslund, J. (1984). What is necessarily true in psychology? *Annals of Theoretical Psychology, 2,* 241–272.

Smith, J. (1996). Planning about life: An area in need of social-interactive paradigms. In P. B. Baltes & U. M. Staudinger (Eds.), *Interactive minds: Life-span perspectives on the social foundations of cognition* (pp. 242–275). New York: Cambridge University Press.

Smith, J. (1999). Life planning: Anticipating future life goals and managing personal development. In J. Brandtstädter & R. M. Lerner (Eds.), *Action and self-development: Theory and research through the life span* (pp. 223–255). Thousand Oaks, CA: Sage.

Smith, M. J. (1982). *Persuasion and human action: A review and critique of social influence theories.* Belmont, CA: Wadsworth.

Snyder, C. R., & Higgins, R. L. (1988). Excuses: Their effective role in the negotiation of reality. *Psychological Bulletin, 104,* 23–35.

Snyder, M. (1979). Self-monitoring processes. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 12, pp. 85–128). New York: Academic Press.

Snyder, M., & Campbell, B. H. (1982). Self-monitoring: The self in action. In J. Suls (Ed.), *Psychological perspectives on the self* (Vol. 1, pp. 185–208). Hillsdale, NJ: Erlbaum.

Spranger, E. (1914). *Lebensformen: Geisteswissenschaftliche Psychologie und Ethik der Persönlichkeit.* Tübingen, Germany: Niemeyer.

Srull, T. K., & Wyer, R. S., Jr. (1986). The role of chronic and temporary goals in social information processing. In R. M. Sorrentino & E. T. Higgins (Eds.), *Handbook of motivation and cognition: Foundations of social behavior* (pp. 503–549). New York: Guilford Press.

Stangor, C., & Ruble, D. N. (1987). Development of gender role knowledge and gender constancy. In L. S. Liben & M. L. Signorella (Eds.), *New directions for child development: Vol. 39. Children's gender schemata* (pp. 5–22). San Francisco: Jossey-Bass.

Stangor, C., & Ruble, D. N. (1989). Differential influence of gender schemata and gender constancy on children's information processing and behavior. *Social Cognition, 7,* 353–372.

Staudinger, U. M., Marsiske, M., & Baltes, P. B. (1995). Resilience and reserve capacity in later adulthood: Potentials and limits of development across the life span. In D. Cicchetti & D. Cohen (Eds.), *Developmental psychopathology: Vol. 2. Risk disorder and adaptation* (pp. 801–847). New York: Wiley.

Steele, C. M. (1988). The psychology of self-affirmation: Sustaining the integrity of the self. In L. Berkowitz (Ed.), *Advances in experimental social psychology: Vol. 21. Social psychological studies of the self—Perspectives and programs* (pp. 261–302). New York: Academic Press.

Sternberg, R. J., & Wagner, R. K. (Eds.). (1986). *Practical intelligence: Nature and origins of competence in the everyday world.* New York: Cambridge University Press.

Stock, W. A., Okun, M. A., Haring, M. J., & Witter, R. A. (1983). Age and subjective well-being: A meta-analysis. In R. J. Light (Ed.), *Evaluation studies: Review annual* (Vol. 8, pp. 279–302). Beverly Hills, CA: Sage.

Strack, F., Schwarz, N., Chassein, B., Kern, D., & Wagner, D. (1990). Salience of comparison standards and the activation of social norms: Consequences for judgements of happiness and their communication. *British Journal of Social Psychology, 29,* 303–314.

Strauss, S., & Ephron-Wertheim, T. (1986). Structure and process: Developmental psychology as looking in the mirror. In I. Levin (Ed.), *Stage and structure: Reopening the debate* (pp. 59–76). Norwood, NJ: Ablex.

Super, C. M., & Harkness, S. (1986). The developmental niche. *International Journal of Behavioral Development, 9,* 545–570.

Swann, W. B. (1983). Self-verification: Bringing the social reality in harmony with the self. In J. Suls & A. G. Greenwald (Eds.), *Psychological perspectives on the self* (Vol. 2, pp. 33–66). Hillsdale, NJ: Erlbaum.

Swann, W. B., Jr., Griffin, J. J., Jr., Predmore, S. C., & Gaines, B. (1987). The cognitive-affective crossfire: When self-consistency confronts self-enhancement. *Journal of Personality and Social Psychology, 52,* 881–889.

Tatarkiewicz, W. (1976). *Analysis of happiness.* Den Haag, The Netherlands: Martinus Nijhoff.

Taylor, C. (1989). *Sources of the self: The making of the modern identity.* Cambridge, MA: Harvard University Press.

Taylor, C., & Schneider, S. K. (1989). Coping and the simulation of events. *Social Cognition, 7,* 174–194.

Taylor, S. E. (1989). *Positive illusions: Creative self-deception and the healthy mind.* New York: Basic Books.

Taylor, S. E. (1991). Asymmetrical effects of positive and negative events: The mobilization-minimization hypothesis. *Psychological Bulletin, 110,* 67–85.

Taylor, S. E., & Crocker, J. (1981). Schematic bases of social information processing. In E. T. Higgins, C. P. Herman, & M. P. Zanna (Eds.), *Social cognition* (pp. 89–134). Hillsdale, NJ: Erlbaum.

Tesser, A. (1986). Some effects of self evaluation maintenance on cognition and action. In R. M. Sorrentino & E. T. Higgings (Eds.), *Handbook of motivation and cognition: Foundations of social behavior* (pp. 435–464). New York: Guilford Press.

Tetens, J. N. (1777). *Philosophische Versuche über die menschliche Natur und ihre Entwicklung* (Vol. 1). Leipzig, Germany: M. G. Weidmanns Erben und Reich.

Thalberg, J. (1977). *Perception, emotion, and action: A component approach.* Oxford, England: Blackwell.

Thomae, H. (1968). *Das Individuum und seine Welt.* Göttingen, Germany: Hogrefe.

Thomas, A., & Chess, S. (1977). *Temperament and development.* New York: Brunner & Mazel.

Thompson, S. C., Cheek, P. R., & Graham, M. A. (1988). The other side of perceived control: Disadvantages and negative effects. In S. Spacapan & S. Oskamp (Eds.), *The social psychology of health* (pp. 69–93). Newbury Park, CA: Sage.

Tipper, S. P., & Cranston, M. (1985). Selective attention and priming: Inhibitory and facilitatory effects of ignored primes. *Quarterly Journal of Experimental Psychology, 37A,* 591–611.

Tobach, E. (1981). Evolutionary aspects of the activity of the organism and its development. In R. M. Lerner & N. A. Busch-Rossnagel (Eds.), *Individuals as producers of their development: A life-span perspective* (pp. 37–68). New York: Academic Press.

Toulmin, S. E. (1969). Concepts and the explanation of human behavior. In T. Mischel (Ed.), *Human action: Conceptual and empirical issues* (pp. 71–104). New York: Academic Press.

Toulmin, S. E. (1974). Rules and their relevance for understanding human behavior. In T. Mischel (Ed.), *Understanding other persons* (pp. 185–215). Oxford, England: Blackwell.

Toulmin, S. E. (1977). The end of the Parmenidean era. In Y. Elkana (Ed.), *The interaction between science and philosophy* (pp. 171–193). Atlantic Highlands, NJ: Humanities Press.

Trudewind, C., Unzner, L., & Schneider, K. (1989). Die Entwicklung der Leistungsmotivation. In H. Keller (Ed.), *Handbuch der Kleinkindforschung* (pp. 491–524). Berlin, Germany: Springer.

Turiel, E., & Davidson, P. (1986). Heterogenity, inconsistency, and asynchrony in the development of cognitive structures. In I. Levin (Ed.), *Stage and structure: Reopening the debate* (pp. 106–143). Norwood, NJ: Ablex.

Tyler, S. A. (Ed.). (1969). *Cognitive anthropology.* New York: Holt, Rinehart and Winston.

Vallacher, R. R., & Wegner, D. M. (1987). What do people think they're doing? Action identification and human behavior. *Psychological Review, 94,* 3–15.

Valle, V. A., & Frieze, I. H. (1976). Stability of causal attributions as a mediator in changing expectations for success. *Journal of Personality and Social Psychology, 33,* 579–587.

Valsiner, J. (1987a). *Culture and the development of children's action.* New York: Wiley.

Valsiner, J. (1987b). *Developmental psychology in USSR.* Brighton, England: Harvester Press.

Valsiner, J. (Ed.). (1988a). *Child development within culturally structured environments: Vol. 1. Parental cognition and adult-child interaction.* Norwood, NJ: Ablex.

Valsiner, J. (Ed.). (1988b). *Child development within culturally structured environments: Vol. 2. Social co-construction and environmental guidance in development.* Norwood, NJ: Ablex.

Valsiner, J. (1988c). Ontogeny of co-construction of culture within socially organized environmental settings. In J. Valsiner (Ed.),

Child development within culturally structured environments: Vol. 2. Social co-construction and environmental guidance in development (pp. 283–297). Norwood, NJ: Ablex.

Valsiner, J. (1989). *Human development and culture.* Lexington, MA: D. C. Heath.

Valsiner, J. (1998). *The guided mind.* Cambridge, MA: Harvard University Press.

van der Veer, R., & Valsiner, J. (1991). *Understanding Vygotsky: A quest for synthesis.* Oxford, England: Blackwell.

Vico, G. B. (1948). *The new science of Giambattista Vico* (T. G. Bergin & M. H. Fisch, Trans., 3rd ed.). Ithaca, NY: Cornell University Press. (Original work published 1725 in Italian)

von Cranach, M. (1982). The psychological study of goal-directed action: Basic issues. In M. von Cranach & R. Harré (Eds.), *The analysis of action: Recent theoretical and empirical advances* (pp. 35–75). Cambridge, England: Cambridge University Press.

Vroom, V. H. (1964). *Work and motivation.* New York: Wiley.

Vygotsky, L. S. (1978). *Mind in society.* Cambridge, MA: Harvard University Press.

Vygotsky, L. S. (1979). The instrumental method in psychology. In J. V. Wertsch (Ed.), *The concept of activity in Soviet psychology* (pp. 134–143). Armonk, NY: Sharpe. (Original work published 1960 in Russian)

Vygotsky, L. S. (1986). *Thought and language* (2nd ed. rev.). Cambridge, MA: MIT Press. (Original work published 1934 in Russian)

Waismann, F. (1979). *Wittgenstein and the Vienna Circle.* New York: Barnes & Noble.

Ward, R. A. (1984). The marginality and salience of being old: When is age relevant? *Gerontologist, 24,* 227–232.

Warren, N. (1980). Universality and plasticity, ontogeny and phylogeny: The resonance between culture and cognitive development. In J. Sants (Ed.), *Developmental psychology and society* (pp. 290–326). London: Macmillan.

Wartofsky, M. W. (1971). From praxis to logos: Genetic epistemology and physics. In T. Mischel (Ed.), *Cognitive development and epistemology* (pp. 129–147). New York: Academic Press.

Watkins, J. W. N. (1957). Historical explanation in the social sciences. *British Journal for the Philosophy of Science, 8,* 104–117.

Watson, J. B. (1930). *Behaviorism.* New York: Norton.

Watson, J. S. (1966). The development of "contingency awareness" in early infancy: Some hypotheses. *Merrill-Palmer-Quarterly, 12,* 123–135.

Weiner, B. (1982). An attributionally based theory of motivation and emotion: Focus, range, and issues. In N. T. Feather (Ed.), *Expectations and actions: Expectancy-value models in psychology* (pp. 163–206). Hillsdale, NJ: Erlbaum.

Weisz, J. R. (1983). Can I control it? The pursuit of veridical answers across the life span. In P. B. Baltes & O. G. Brim (Eds.), *Life-span development and behavior* (Vol. 5, pp. 233–300). New York: Academic Press.

Weisz, J. R., & Cameron, A. M. (1985). Individual differences in the student's sense of control. In C. Ames & R. E. Ames (Eds.), *Research on motivation and education: The classroom milieu* (Vol. 2, pp. 93–140). New York: Academic Press.

Wells, L. E., & Stryker, S. (1988). Stability and change in self over the life course. In P. B. Baltes, D. L. Featherman, & R. M. Lerner (Eds.), *Life-span development and behavior* (Vol. 8, pp. 191–229). Hillsdale, NJ: Erlbaum.

Wentura, D. (1995). *Verfügbarkeit entlastender Kognitionen: Zur Verarbeitung negativer Lebenssituationen.* Weinheim, Germany: Psychologie Verlags Union.

Wertsch, J. V. (Ed.). (1981). *The concept of activity in Soviet psychology.* Armonk, NY: Sharpe.

Wertsch, J. V. (1984). The zone of proximal development: Some conceptual issues. In B. Rogoff & J. V. Wertsch (Eds.), *Children's learning in the zone of proximal development: New directions in child development* (Vol. 23, pp. 7–18). San Francisco: Jossey-Bass.

White, R. W. (1959). Motivation reconsidered: The concept of competence. *Psychological Review, 66,* 297–333.

Wicklund, R. A., & Brehm, J. W. (1976). *Perspectives on cognitive dissonance.* Hillsdale, NJ: Erlbaum.

Wicklund, R. A., & Gollwitzer, P. M. (1982). *Symbolic self-completion.* Hillsdale, NJ: Erlbaum.

Wills, T. A. (1991). Similarity and self-esteem in downward comparison. In J. Suls & T. A. Wills (Eds.), *Social comparison: Contemporary theory and research* (pp. 51–78). Hillsdale, NJ: Erlbaum.

Winch, P. (1958). *The idea of a social science.* London: Routledge & Kegan Paul.

Wittgenstein, L. (1969). *Über Gewißheit* [On certainty]. (G. E. M. Anscombe & G. H. von Wright, Eds.). Oxford, England: Blackwell.

Wollheim, R. (1984). *The thread of life.* Cambridge, MA: Harvard University Press.

Wong, P. T. P., & Watt, L. M. (1991). What types of reminiscence are associated with successful aging? *Psychology and Aging, 6,* 272–279.

Wood, D., Bruner, J. S., & Ross, G. (1976). The role of tutoring in problem-solving. *Journal of Child Psychology and Psychiatry, 17,* 89–100.

Wortman, C. B., & Brehm, J. W. (1975). Responses to uncontrollable outcomes: An integration of reactance theory and the learned helplessness model. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 8, pp. 278–336). New York: Academic Press.

Wozniak, R. H. (1993). Co-constructive metatheory for psychology: Implications for an analysis of families as specific social contexts for development. In R. H. Wozniak & K. W. Fischer (Eds.), *Development in context: Acting and thinking in specific environments* (pp. 77–92). Hillsdale, NJ: Erlbaum.

Wright, R. A., & Brehm, J. W. (1989). Energization and goal attractiveness. In L. A. Pervin (Ed.), *Goal concepts in personality and social psychology* (pp. 169–210). Hillsdale, NJ: Erlbaum.

Zélény, M. (Ed.). (1981). *Autopoiesis: A theory of living organization.* New York: North Holland.

Zirkel, S., & Cantor, N. (1990). Personal construal of life tasks: Those who struggle for independence. *Journal of Personality and Social Psychology, 58,* 172–195.

Zivin, G. (Ed.). (1979). *The development of self-regulation through private speech.* New York: Wiley.

CHAPTER 11

Life Span Theory in Developmental Psychology

PAUL B. BALTES, ULMAN LINDENBERGER, and URSULA M. STAUDINGER

HISTORICAL INTRODUCTION 571
TOWARD PSYCHOLOGICAL THEORIES OF LIFE SPAN DEVELOPMENT: FIVE LEVELS OF ANALYSIS 574
The Overall Architecture of Life Span Development: A First View from the Perspectives of Biological and Cultural Co-Evolution and Biocultural Co-Construction (Level 1) 575
Life Span Changes in the Relative Allocation of Resources to Distinct Functions of Development (Level 2) 578
A Family of Metatheoretical Propositions about Life Span Developmental Theory (Level 3) 580
An Example of a Systemic and Overall Theory of Life Span Development: Selective Optimization with Compensation (Level 4) 591
FIRST LEVEL 5 EXAMPLE: INTELLECTUAL FUNCTIONING ACROSS THE LIFE SPAN 595
The Biology and Culture of Life Span Intellectual Development 596
The Fluid Mechanics of Cognition 600
The Crystallized Pragmatics of Cognition 604
Varieties of Mechanic/Pragmatic Interdependence 609
Malleability (Plasticity) in Intellectual Functioning across Historical and Ontogenetic Time 611
Relative Stability in Intellectual Functioning across the Life Span 612
Changes in Heritability across the Life Span 614
The Mechanics and Pragmatics in Very Old Age 615
LIFE SPAN INTELLECTUAL DEVELOPMENT: CONCLUSIONS 617
SECOND LEVEL 5 EXAMPLE: THE STUDY OF PERSONALITY DEVELOPMENT ACROSS THE LIFE SPAN 619
Three Approaches to the Study of Personality Development 619
Key Features of a Life Span Approach to the Study of Personality Development 620
Illustrations of the Role of Biology and Culture in Personality Development 623
The Allocation of Resources in Personality Functioning 625
Personality Development as Lifelong Transactional Adaptation: Continuity and Change 626
Reserve Capacities of Self and Personality Development 637
Summarizing Foci and Facets of Personality Development across the Life Span 642
CONCLUDING COMMENTARY 643
REFERENCES 644

Life span developmental psychology, now often abbreviated as life span psychology, deals with the study of individual development (ontogenesis) from conception into old age (P. B. Baltes, 1987, 1997, 2005; P. B. Baltes & Goulet, 1970; P. B. Baltes & Smith, 2004; Brim & Wheeler, 1966; Dixon & Lerner, 1988; Li & Freund, 2005; Neugarten, 1969; J. Smith & Baltes, 1999; Staudinger & Lindenberger, 2003; Thomae, 1979). A core assumption of life span psychology is that development is not completed at adulthood (maturity). Rather, ontogenesis extends across the entire life course and lifelong adaptive processes are involved. A further premise is that the concept of development can be used to organize the evidence about lifelong adaptive processes, although it is necessary to reformulate the traditional concept of development for this purpose (Harris, 1957). The reformulation required highlights that adaptive changes across life can be more open and multidirectional than the traditional concept of development with its strong focus on development as growth in the sense of maturation and advancement may suggest.

Sequencing in the life span gives temporal priority to earlier times and events in life. Aside from this temporal order of any developmental process, however, life span researchers expect each age period of the life span (e.g., infancy, childhood, adolescence, adulthood, old

age) to have its own developmental agenda and to make some unique contribution to the organization of the past, present, and future in ontogenetic development. Moreover, life span developmental scholars, if they focus on processes and mechanisms of mind and behavior (such as identity of self or working memory) rather than on age, proceed from the assumption that these processes and mechanisms themselves express manifestations of developmental continuity and change across the entire life span.

Psychology deals with the scientific study of mind and behavior, including practical applications that can be derived from such scientific inquiry. Within this substantive territory of psychology, the objectives of life span psychology are: (a) To offer an organized account of the overall structure and sequence of development across the life span; (b) to identify the interconnections between earlier and later developmental events and processes; (c) to delineate the biological, psychological, social, and environmental factors and mechanisms which are the foundation of life span development; and (d) to specify the biological and environmental opportunities and constraints that shape life span development of individuals including their range of plasticity (modifiability). With such information, life span developmentalists further aspire to determine the range of possible development of individuals, to empower them to live their lives as desirably (and effectively) as possible, and to help them avoid dysfunctional and undesirable behavioral outcomes.

To this end, life span researchers have focused on searching for models and definitions of successful (effective) development. In general, and despite the search for universal considerations, life span researchers have highlighted individual and cultural variations in what is considered success or healthy. One general approach to this topic has been to define successful development as the maximization of gains and the minimization of losses and to consider in the definition of what constitutes gains and losses individual, group, and cultural factors (M. M. Baltes & Carstensen, 1996; P. B. Baltes, 1987; P. B. Baltes & Baltes, 1990a, 1990b; Brandtstädter & Wentura, 1995; Marsiske, Lang, Baltes, & Baltes, 1995). Such an approach is consistent with the postulate that there is no development (ontogenetic change) without a loss, just as there is no loss without a gain (P. B. Baltes, 1987). What is considered a gain in ontogenetic change and what is considered a loss is a topic of theoretical as well as empirical inquiry and defies an absolutist definition. The nature of what is considered a gain and what is considered a loss changes with age, involves objective and subjective criteria, and is conditioned by theoretical predilection and cultural context, as well as historical time.

We offer one more introductory observation on the objectives of life span psychology that it shares with other developmental specialties. Methodologically speaking, the study of ontogenesis is inherently a matter of general *and* differential psychology. Thus, life span research and theory is intended to generate knowledge about three components of individual development: (1) commonalities (regularities) in development, (2) interindividual differences in development, and (3) intraindividual plasticity in development (P. B. Baltes, Reese, & Nesselroade, 1977; R. M. Lerner, 1984; S.-C. Li & Freund, 2005; J. R. Nesselroade, 1991a, 1991b; Staudinger & Lindenberger, 2003). Joint attention to each of these components of individual variability and intra-individual potential, and specification of their age-related interplays, are the conceptual and methodological foundations of the developmental enterprise. Recognizing the methodological significance of the distinction among, and subsequent theoretical integration of, commonalities in development, inter-individual differences in development, and intra-individual plasticity has been a continuing theme in life span research and theory since its inception (Tetens, 1777).

What about the status and location of life span psychology within the territory of developmental psychology? Is life span developmental psychology a special developmental psychology, is it the overall integrative developmental conception of ontogenesis, or is it simply one of the many orientations to the study of development (P. B. Baltes, 1987)? Perhaps most scholars view life span psychology as one of the specializations in the field of developmental psychology, namely, that specialization that seeks to understand the full age spectrum of ontogenesis. In this case, the lens of life span psychologists is focused on the entire life course with less consideration for the details of age-related specificities.

Life span theory, however, can also be seen as the coordinated integration of various age-based developmental specializations into one overarching, cumulative framework of ontogenesis. Using such a life span-coordinating lens, one could argue that, if there is a general theory of ontogenetic development, it needs to be a theory that takes into account that ontogenesis extends from conception into old age. Thus, even if one is primarily inter-

ested in the study of infants and infant development, part of one's intellectual agenda requires attention to life span development (Brim, 1976). One example relevant for infancy researchers is the interest in the sequelae of infancy, in the search for its long-term consequences. Another example is the developmental context of infancy, which includes adults as socialization agents who themselves develop. Thus, to understand infant-adult interaction, it is important to recognize that adults are not fixed personages but that they are themselves subject to developmental goals and challenges (Brim & Wheeler, 1966; Hetherington, Lerner, & Perlmutter, 1988; Lachman, 2001; see also Elder & Shanahan, Chapter 12, this *Handbook,* this volume).

What about the organizational frame of life span theory? On a strategic level, there are two ways to construct life span theory: *Person-centered (holistic)* or *function-centered.* The holistic approach proceeds from consideration of the person as a system and attempts to generate a knowledge base about life span development by describing and connecting age periods or states of development into one overall, sequential pattern of lifetime individual development (see also Magnusson, 2001; Magnusson & Strattin, Chapter 8; Thelen & Smith, Chapter 6, this *Handbook,* this volume). An example would be Erikson's (1959) theory of eight life span stages. Often, this holistic approach to the life span is identified with *life course psychology* (Bühler, 1933; see also Elder, 1994; Elder & Shanahan, Chapter 12, this *Handbook,* this volume). Part of a holistic approach includes also efforts where behavioral profiles across a wide range of psychological functioning are in the center of attention and different age groups are contrasted in their profiles and longitudinal interconnections (J. Smith & Baltes, 1997).

The second way to construct life span theory is to focus on a category of behavior or a function (such as perception, information processing, action control, identity, personality traits, etc.) and to characterize the life span changes in the mechanisms and processes associated with the category of behaviors selected. An example would be the life span comparative study of the developmental organization, operation, and transformation of working memory, fluid intelligence, or the cognitive system as a whole (Craik & Bialystok, in press; Salthouse, 1991).

To incorporate both approaches to life span ontogenesis, the holistic person-centered and the function-centered one, the concept of *life span developmental psychology* (P. B. Baltes & Goulet, 1970) was advanced. From our point of view, then, life course psychology is a special case of life span psychology. However, this distinction between life course and life span developmental psychology should not be seen as categorically exclusive. It's more a matter of pragmatics and scientific history. In the history of the field, scholars closer to the social sciences, the biographical study of lives, and personality psychology display a preference for using the term life course development (e.g., Bühler, 1933; Caspi, 1987; Elder, 1994; Settersten, 2005). Scholars closer to psychology, with its traditional interest in mechanisms and processes as well as the decomposition of mind and behavior into its component elements, seem to prefer life span developmental psychology, the term chosen when the West Virginia Conference Series on the field was initiated (Goulet & Baltes, 1970).

HISTORICAL INTRODUCTION

While this section may seem to speak more about the past than the present, it is important to recognize that present theoretical preferences are in part the direct result of historical contexts of science and cultural scenarios rather than of carefully elaborated theoretical arguments. Some of the current issues surrounding life span psychology and its location in the larger field of developmental psychology are difficult to appreciate unless they are seen in their historical and societal contexts (P. B. Baltes, 1983; Brim & Wheeler, 1966; R. M. Lerner, 1983; Lindenberger & Baltes, 1999; Reinert, 1979). For instance, how is it that, especially in North America, life span developmental psychology is a relatively recent advent? This is not true for Germany where life span thinking has a long history.

Many German developmental historians, for instance, consider Johann Nicolaus Tetens as the founder of the field of developmental psychology (P. B. Baltes, 1983; Lindenberger & Baltes, 1999; Müller-Brettel & Dixon, 1990; Reinert, 1979). To Anglo-American developmentalists, however, Tetens is a relatively unknown figure. When Tetens published his two-volume monumental work on human nature and its development *Menschliche Natur and ihre Entwicklung* more than 200 years ago, in 1777, the scope of this first major opus covered the entire life span from birth into old age (see also Carus, 1808, for another early contribution to the

field of developmental psychology). In addition, the content and theoretical orientation of this historical classic by Tetens included many of the current-day signatures of what has become known as the life span developmental theoretical orientation. For instance, development was not only elaborated as a lifelong process by Tetens, but also as a process that entails gains and losses, a process embedded in and constituted by sociocultural conditions, and as a process that is continuously refined and optimized *(vervollkommnet)* by societal change and historical transformations (see Table 11.1).

The second major early work on human development, written some 150 years ago by the Belgian Adolphe Quetelet (1835/1842), continued in a similar tradition. His treatment of human qualities and abilities was entirely life span in orientation, and because of his analysis of the dynamics between individual and historical development, Quetelet prefigured major developments in developmental methodology (P. B. Baltes, 1983). For instance, he anticipated the distinction between cross-sectional and longitudinal study designs as well as the need to conduct successions of age studies in order to disentangle effects of age from those of secular change and historical period (P. B. Baltes, 1968; Schaie, 1965; Schaie & Baltes, 1975).

The 1777 work of Johann Nicolaus Tetens was never translated into English. It is unfortunate because reading Tetens' deep, although largely conceptual and not empirical insights into the interplay among individual, contextual, and historical factors is a humbling experience. Equally impressive are his many concrete everyday examples and analyses of phenomena of human development (e.g., in the area of memory functioning), which make clear that ontogenetic development is not simply a matter of growth but the outcome of complex and multilinear processes of adaptive transformation. Because of these consistencies between the early work of Tetens and Quetelet and modern research in life span development, life span researchers like to argue that these are examples of why and how a life span orientation spawns a particular theoretical and methodological manner of looking at human development (P. B. Baltes, 1987; P. B. Baltes, Reese, & Lipsitt, 1980; Staudinger & Lindenberger, 2003).

TABLE 11.1 Table of Contents

Chapter	Title
1	On the perfectability of human psyche (Seelennatur) and its development in general
2	On the development of the human body
3	On the analogy between the development of the psyche (mind) and the development of the body
4	On the differences between men (humans) in their development
5	On the limits of development and the decline of psychological abilities
6	On the progressive development of the human species
7	On the relationship between optimization (Vervollkommnung) of man and his life contentment (Glückseligkeit)

Source: From *On the Perfectability and Development of Man,* volume 2, by J. N. Tetens, 1777, Leipzig, Germany: Weidmanns Erben und Reich.

There are several reasons why German developmental psychology treated and treats ontogenesis as lifelong development (P. B. Baltes et al., 1980; Groffmann, 1970; Reinert, 1979). In German-speaking countries, for instance, philosophy, in addition to biology, was a major springboard for the emergence of life span psychology. Because of this close tie to philosophy and the humanities, human development in Germany was widely understood to reflect factors of education, socialization, and culture. In addition, there was also a focus on the topic of human development beyond early adulthood. The widespread knowledge and discussion of essays on old age, such as the ancient texts of Cicero (44B.C./1744) or the then contemporary text of Grimm (1860), are examples of this nineteenth-century interest among German scholars in issues of development beyond early adulthood. According to these traditions, fueled primarily by philosophy and the humanities, a widely held position among German scholars was that it was within the medium of "culture" that individuals "developed." With very little biological science on maturity or growth at that time, there was no reason to assume that development should be identified with physical growth and, therefore, should stop at adolescence or early adulthood.

In contrast, the Zeitgeist in North America and also in some other European countries, such as England, was different when developmental psychology emerged as a specialty around the turn of the century (1900). At that time, the newly developed fields of genetics and biological evolution (such as Darwinism) were in the forefront of ontogenetic thinking. From biology, with its maturation-based concept of growth, may have sprung the dominant American emphasis in developmental psychology on child psychology and child development. In North America, at least until the advent of social-learning and operant psychology-based theory in the 1960s (Bandura & Walters, 1963; Reese & Lipsitt, 1970), biological con-

ceptions of growth and maturation (Harris, 1957) led the organization and intellectual agenda in ideas about development. Not surprisingly, therefore, in combination with other political and social forces, children became the primary focus of attention in North American developmental psychology.

The focus on childhood was so pervasive that historical accounts of developmental psychology published in the centennial birth year of American psychology (Parke, Ornstein, Rieser, & Zahn-Waxler, 1991) were entirely devoted to child and adolescent development. No mention was made of the major historical life span scholars such as Tetens, Bühler, or Pressey. Even Sheldon White (1992), the author of the centennial article on G. Stanley Hall, one of the major figures in early American developmental psychology who late in his career turned to adulthood and old age to complete his agenda of developmental studies (see Hall, 1922), ignored this opportunity to treat ontogenesis as a lifelong phenomenon.

Before the life span view of ontogenesis entered the field of developmental psychology more forcefully in North American circles in the 1960s and 1970s, several earlier contributions attempted to broaden developmental psychology toward a consideration of the entire life span (e.g., Hollingworth, 1927; Pressey, Janney, & Kuhlen, 1939; Sanford, 1902). These early American publications on themes of life span development resulted not so much in redirecting developmental psychology from child psychology, but in setting the foundation for the emergence of the field of adult development and aging (gerontology). Indeed, many of the active life span psychologists who promoted life span thinking were closely affiliated with efforts to build a psychological science of aging (Goulet & Baltes, 1970; Havighurst, 1948, 1973; Kuhlen, 1963; Neugarten, 1969; Riegel, 1958; Schaie, 1970; Thomae, 1959, 1979).

As a consequence, in American psychology there evolved a strong bifurcation between child developmentalists and researchers on adult development and aging. One indication of this bifurcation was the creation of two relatively independent divisions concerned with lifelong ontogenesis within the American Psychological Association (Division 7: Developmental Psychology; Division 20: Maturity and Old Age, later renamed into Adult Development and Aging). This divide was also reflected in scholarly publications involving age-specific specialties. On the one hand, the creation of a multitude of organizations and journals heralded the arrival of a comprehensive behavioral science of ontogenesis, a trend that continues. The most recent addition of a "new" age specialty is midlife, and not inappropriate for the beginning of a new century, the first handbook on the topic was published (Lachman, 2001). The emergence of this field of midlife development was much enhanced by the work of a MacArthur Network on Midlife Development chaired by one of the early leaders of the life span field, Orville G. Brim (e.g., Brim & Wheeler, 1966; see also Brim, Ryff, & Kessler, 2004). On the other hand, for life span developmental scholars, these age-specific creations were unfortunate events because they did not promote an integrative effort at constructing life span theory.

That a life span approach became more prominent during the recent decades was dependent on several other factors and historical trends. A major factor was a concurrent concern with issues of life span development in neighboring social-science disciplines, especially sociology and economics. In sociology, life course sociology took hold as a powerful intellectual force (Brim & Wheeler, 1966; Elder, 1985, 1994; Mayer, 2003; Riley, 1987; Riley, Johnson, & Foner, 1972; Settersten, 2005).

Within psychology, and aside from the intellectual forces that may have been inherent in the life span field itself (see later sections in this chapter), three external conditions nurtured the burgeoning of interest in life span development (P. B. Baltes, 1987). First, demographically speaking, the population as a whole was aging. Meanwhile, this historical change in the demographic context of human development has been fully reflected in the organization of the American Psychological Association (APA). Perhaps surprising to child developmentalists, the Division (20) devoted to adult development and aging has grown larger than Division 7, called developmental psychology but which, when using the focus of the work of the scholars elected to its presidency, or the scope of its primary journal as indicators, is more or less entirely devoted to the topic of development from infancy through adolescence.

The second related historical event of life span work in the study of ontogenesis was the concurrent emergence of gerontology (aging research) as a field of specialization, with its search for the lifelong precursors of aging (Birren, 1959; Birren & Schaie, 1996; Cowdry, 1939). The Gerontological Society of America, for instance, is as large or larger than its counterpart organization, the Society for Research in Child Development. In fact, linking the study of gerontology to the study of

life span development is a critical task of current developmental theory. Are theories of development the same as theories of aging? Do we need different conceptions of ontogenesis to characterize development and aging (P. B. Baltes & Smith, 2004)? For instance, does one approach deal with phenomena of growth, and the other with decline?

A third factor, and a major source of rapprochement between child developmentalists and adult developmentalists, was the "aging" of the participants and of the researchers in the several classical longitudinal studies on child development begun in the 1920s and 1930s (Elder, 1974; Kagan, 1964). What are the effects of child development on later life? Which childhood developmental factors are positive or risk-prone for later healthy development? These were questions that were increasingly pursued beginning in the 1970s as the children of the classical longitudinal studies reached early adulthood and midlife. Some of these studies have even provided a basis for a better understanding of processes in the last phases of life (Block, 1971, 1993; Eichorn, Clausen, Haan, Honzik, & Mussen, 1981; Elder, 1985, 1986, 1994; Holahan, Sears, & Cronbach, 1995; Kagan & Moss, 1962; Sears & Barbee, 1977).

Out of these developments has emerged new territory in developmental scholarship. The need for better collaboration among all age specialities of developmental scholarship, including child development, has become an imperative of current-day research in developmental psychology (Hetherington et al., 1988). But for good life span theory to evolve, it takes more than courtship and mutual recognition. It takes a new effort and serious exploration of theory that—in the tradition of Tetens (1777)—has in its *primary* substantive focus the structure, sequence, and dynamics of the entire life course.

TOWARD PSYCHOLOGICAL THEORIES OF LIFE SPAN DEVELOPMENT: FIVE LEVELS OF ANALYSIS

We approach psychological theories of life span development in five sequential but interrelated steps. Each step will bring us closer to specific psychological theories of life span development. As shown in Table 11.2, we move from the distal and general to the more proximal and specific in our treatment of life span ontogenesis. This movement also implies a movement from the metatheoretical to the more empirical.

TABLE 11.2 Toward Psychological Theories of Life Span Development: Five Levels of Analysis

Level 1:	Biological and Cultural Evolutionary Perspectives: On the Incomplete Architecture of Human Ontogenesis and the Life Span Developmental Dynamics between Biology and Culture
Level 2:	Dynamics of Gains and Losses: Life Span Changes in the Relative Allocation of Resources in Development to Functions of Growth versus Maintenance/Resilience versus Regulation of Loss
Level 3:	A Family of Metatheoretical Propositions about the Nature of Life Span Development
Level 4:	An Example of a Systemic and Overall Theory of Successful Life Span Development: Selective Optimization with Compensation
Level 5:	Life Span Theories in Specific Functions and Domains: Intelligence, Cognition, Personality, Self

Specifically, we consider five levels of analysis. Level 1, the most distal and general one, makes explicit the cornerstones and "norms of reaction" or "potentialities" (P. B. Baltes, 1997; P. B. Baltes & Smith, 2004; Brent, 1978a, 1978b; R. M. Lerner, 2002; S.-C. Li, 2003; Schneirla, 1957; see also Gottlieb, Wahlsten, & Lickliter, Chapter 5, this *Handbook,* this volume) of life span ontogenesis. With this approach, which is also consistent with the levels of integration notion of Schneirla or more recently S.-C. Li (2003), we obtain information on what we can expect about the general scope and shape of life span development based on evolutionary, historical, and interdisciplinary views dealing with the interplay between biology and culture during ontogenesis.

Levels 2 and 3 move toward psychological theories of individual development. On these levels of analysis, while keeping the initial overall framework in mind, we shall describe, using an increasingly more fine-grained level of analysis, specific conceptions of life span developmental psychology. On Level 4, we advance one concrete illustration of an overall life span developmental theory, a theory that is based on the specification and coordinated orchestration of three processes: Selection, optimization, and compensation. Subsequently, and corresponding to a putative Level 5, we move to more molecular phenomena and functions. Specifically, we characterize life span theory and research in areas of psychological functioning such as cognition, intelligence, personality, and the self.

We have chosen this approach—of proceeding from a broad level of analysis to more and more specific and microlevels of psychological analysis—because it illustrates

one of the central premises of life span psychology, that development is embedded in a larger evolutionary, historical, and cultural context (P. B. Baltes et al., 1980; Durham, 1991; Elder & Shanahan, Chapter 12, this *Handbook,* this volume; Finch & Zelinski, 2005; Hagen & Hammerstein, 2005; R. M. Lerner, 2002; S.-C. Li, 2003; Magnusson, 1996; Riegel, 1973; Schaie, Willis, & Pennak, 2005). Recognizing the powerful conditioning of human development by biological and cultural evolution and co-evolution emphasizes that the future is not fixed either, but includes features of an open system. In other words, the future is not something we simply enter but also something that we help create and that is dependent on the partially always novel co-construction of genetic, environmental, and cultural conditions (P. B. Baltes, Reuter-Lorenz, & Rösler, 2006). This is especially true for the second half of life and old age. It is there that the relative incompleteness of the biology- and culture-based architecture of human development becomes most conspicuous (P. B. Baltes, 1997; P. B. Baltes & Smith, 2004).

The Overall Architecture of Life Span Development: A First View from the Perspectives of Biological and Cultural Co-Evolution and Biocultural Co-Construction (Level 1)

We now turn in our quest for understanding life span development to the first level of analysis chosen, the overall biological and cultural architecture of life span development (P. B. Baltes, 1997).

Questions about the how and why of the role of biology (heredity) and culture (environment) have formed one of the main intellectual frames in developmental psychology. What is the role of cultural and biological factors in ontogenesis, how do they interact, condition, and modify each other? What is the "zone of development," the "norm of reaction," the "range of plasticity" that we can expect to operate during ontogenesis? Based on genetic and evolution-based factors and on cultural structures, for instance, only certain pathways can be implemented during ontogenesis, and some of these are more likely to be realized than others. Despite the sizeable plasticity of humans, not everything is possible in ontogenetic development. Development follows principles that make universal growth impossible (Hagen & Hammerstein, 2005; S.-C. Li & Freund, 2005).

With a view on the future and future societal changes, we need to recognize first that the overall architecture of human development is incomplete (P. B. Baltes, 1997; P. B. Baltes & Smith, 2003): The overall biological and cultural architecture of human development continues to evolve and in this process co-constructs and modifies each other (P. B. Baltes, et al., 2006). A second insight is that what is most "undeveloped" in the gene-environment interplay is both the genetic base and the culture of old age. While earlier age periods of the life course have a long tradition of biological and cultural co-evolution and co-construction (P. B. Baltes et al., 2006; Durham, 1991; Finch & Zelinski, 2005; Tomasello, 1999) and fine-tuning, the anthropological tradition of biological and cultural co-evolution for later phases of life, historically speaking, is younger. As we move from childhood to old age, the evolutionary (biological and cultural) incompleteness of the overall architecture of the life span increases.

Figure 11.1 illustrates the main lines of argument (P. B. Baltes, 1997; see also Kirkwood, 2003). Note first that the specific form (level, shape) of the functions characterizing the overall life span dynamics is not critical. What is critical is the overall direction and reciprocal relationship between these functions. Figure 11.1 identifies three such directional principles that regulate the nature of ontogenetic development.

Evolutionary Selection Benefits Decrease with Age

The first part of Figure 11.1 represents a conclusion that derives from an evolutionary perspective on the nature of the genome and its age-correlated changes in expressivity (Charlesworth, 1994; Finch, 1990, 1996;

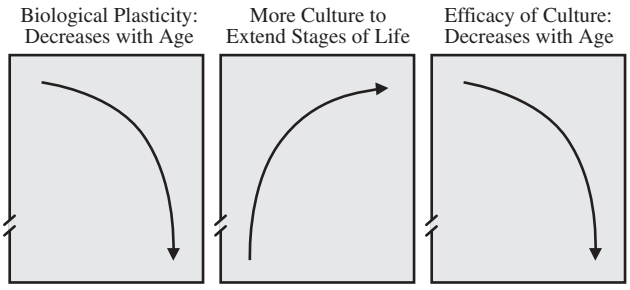

Biological Plasticity: Decreases with Age
More Culture to Extend Stages of Life
Efficacy of Culture: Decreases with Age

Figure 11.1 Schematic representation of basic facts about the average dynamics between biology and culture across the lifespan. There can be much debate about the specific forms of the functions but less about directionality. From "On the Incomplete Architecture of Human Ontogeny: Selection, Optimization, and Compensation as Foundation of Developmental Theory," by P. B. Baltes, 1997, *American Psychologist, 52,* pp. 366–380.

Kirkwood, 2003; Martin, Austad, & Johnson, 1996; Medawar, 1946). The central argument is that the benefits resulting from evolutionary selection display a negative age correlation, that is, that there is an age-associated declining process of evolution-based natural selection.

During evolution, the older the organism, the less the genome benefited from the genetic advantages associated with evolutionary selection. As a consequence, and certainly after maturity, *the expressions and mechanisms of the genome lose in functional quality as organisms age*. Evolutionary selection was tied to the process of reproductive fitness and its midlife location in the life course. As a consequence, reproductive fitness-based evolutionary selection pressure—which in the long run resulted in a better and better genome—operated *primarily* and more strongly during the first half of life. This general statement holds true even though there are "indirect" positive evolutionary selection benefits carried into and located in old age, for instance, through processes of grandparenting, coupling, or exaptation (Gould, 1984).

During evolution, this age-associated diminution of evolutionary selection benefits was further enhanced by the fact that in earlier historical times only few people reached old age. Thus, evolutionary selection could not operate as frequently to begin with when it came to older individuals. Most individuals died before possible negative genetic attributes were activated or possible negative biological effects of earlier developmental events became manifest. Therefore, and quite aside from other factors of the biological processes of aging (Finch, 1990; Kirkwood, 2003; Martin et al., 1996; Osiewacz, 1995; Yates & Benton, 1995), it has been argued that genes active at later stages of the life course are more often deleterious or dysfunctional genes than those operative at earlier times in the life span.

One concrete illustration of this aging-based weakening of evolutionary selection benefits is the existence of late-life illnesses such as Alzheimer dementia (for other examples see Martin et al., 1996). This disease typically does not become manifest until age 70. After age 70, however, it increases markedly in frequency such that among 90- to 100-year-olds Alzheimer dementia has a prevalence of about 50% (Helmchen et al., 1999). This disease is at least in part a late-life disease because reproductive fitness based evolutionary pressure was unable to select against it. Martin et al. (1996) called such an outcome "selection neutrality."

There are other aspects of a biology of aging that imply an age-associated loss in biological functioning. One is the disposal soma theory of aging that attributes senescence to the accumulation of damage and faults in cells and tissues. Related models of biological aging are wear-and-tear theories, entropy-based conceptions as well as interpretations related to the sources of age-accumulated increases in mutations. Note that some of the factors involved are associated directly with the mechanisms and operative processes of ontogenesis itself. Currently, for instance, age-associated increases in oxidative damage are proffered as a key possibility to account for aging-associated losses in biological efficacy (Kirkwood, 2003; Martin et al., 1996). One variant is the so-called counterpart theory of aging (Birren, 1988; Yates & Benton, 1995). It proffers that aging processes in part are the negative by-products of the early life process of growth. Related to this view is the genetic mechanism of "antagonist pleiotropy" (Martin et al., 1996).

These various considerations about the role of genetic factors result in a converging conclusion regarding the biological architecture of life span development (P. B. Baltes, 1997). Where evolutionary selection and the ontogenetic biology of aging are concerned, the life span of humans displays a loss in plasticity and, in addition, an increasingly unfinished architecture. These insights may be captured with the sentence: "Biology is not a good friend of old age." With age, the genetic material, associated genetic mechanisms, and genetic expressions become less effective and less able to generate or maintain high levels of functioning.

Increase in Need for Culture as Human Development Is Extended in Level and Age Range

What about the role of culture and culture-related factors in preparation of and during ontogenesis? By culture, we mean the entirety of psychological, social, material, and symbolic (knowledge-based) resources which humans developed over millennia; and which, as they are transmitted across generations, make human development as we know it possible (P. B. Baltes et al., 2006; Cole, 1996; Damon, 1996; D'Andrade, 1995; Durham, 1991; S.-C. Li, 2003; Shweder, 1991; Tomasello, 1999; Valsiner & Lawrence, 1997). These cultural resources include cognitive skills, motivational dispositions, socialization strategies, physical structures, the world of economics as well that of medical and physical technology.

Figure 11.1 summarizes our view of the life span dynamics associated with culture and culture-based processes (P. B. Baltes, 1997; P. B. Baltes, Staudinger, & Lindenberger, 1999). The middle section represents the proposition that for ontogenetic development to be extended in level and span of life, an increase in the level and quality of cultural resources is required to continue a productive interplay between culture and age across the life span. There are two parts to the argument for an *age-related increase in the need for more culture*.

The first argument is that for human ontogenesis to have reached higher and higher levels of functioning and to extend itself longer spans of life, whether in physical (e.g., sports) or cultural (e.g., reading and writing) domains, there had to be a conjoint evolutionary increase in the richness and dissemination of culture. Thus, human development the way we know it in the modern world is essentially and necessarily tied to the evolution of culture and its impact on genetic evolution and the kind of life environments individuals transact with as they develop during ontogenesis. And the further we expect human ontogenesis to extend itself into adult life and old age, the more it will be necessary for particular cultural factors and resources to emerge to make this possible.

To appreciate the power of the evolution of such culture-based resources in the process of biocultural co-production consider what happened to average life expectancy during the twentieth century in industrialized countries. It was not the genetic make-up of the individual or the population that evinced marked changes during this time. Economic and technological innovations were the central factors. Similarly, the dramatic increase in literacy rates over the past centuries in industrialized nations was not the result of a change in the genome, but above all a change in environmental contexts, cultural resources, and strategies of teaching.

To prevent a possible misunderstanding: The trajectory depicted in the middle panel of Figure 11.1 does not mean that children require little cultural input and support. Biocultural co-construction always operates though in varying combinations (P. B. Baltes et al., 2006; P. B. Baltes & Singer, 2001; Li, 2003). Early in ontogenetic life, because the human organism is still undeveloped biologically, infants and children need a wide variety of psycho-social-material-cultural support. But in terms of overall resource structure, this support in childhood is focused on basic levels of functioning such as environmental sensory stimulation, nutrition, language, and social contact. Subsequent age stages, however, require increasingly more and more differentiated cultural resources, especially if one considers the high levels of knowledge and technology that adults need to acquire in order to function well in modern societies. Thus, it is primarily through the medium of more advanced levels of culture in the biocultural co-construction process that individuals have the opportunity to continue to develop across the higher ages of the life course.

There is a second argument for the theory that, with age, the need for the supportive role of culture increases. Because of the age-related biological weakening and reduced plasticity described in the left part of Figure 11.1, an age-associated increase in "need" for culture is also necessary because more environmental support is necessary to maintain efficacy. Thus, if and when individuals aspire to maintain their previous levels of functioning as they age, culture-based resources (material, social, economic, psychological) are necessary to maintain high levels of functioning. In the aging literature, the work of Craik (1986; Craik & Bialystok, in press) on the role of environmental support to maintain memory efficacy is exemplary.

Age-Related Decrease in Efficiency of Culture

The right panel of Figure 11.1 illustrates a further overall characteristic of the life span developmental dynamic between biology, culture, and age. Here, the focus is on a third cornerstone of the overall architecture of the life course, that is, the efficacy or *efficiency* of cultural factors and resources (P. B. Baltes, 1997).

During the second half of life, we submit that there is an age-associated reduction in the efficiency of cultural factors. With age, and conditioned primarily by the negative biological trajectory of the life course, the relative power (effectiveness) of psychological, social, material, and cultural interventions becomes smaller and smaller. Take cognitive learning in old age as an example (P. B. Baltes, 1993; Craik & Salthouse, 2000; Lindenberger, 2001; Salthouse, 2003; T. Singer, Lindenberger, & Baltes, 2003). The older the adult, the more time, practice, and more cognitive support it takes to attain the same learning gains. And moreover, at least in some domains of information processing, and when it comes to high levels of performance, older adults may never be able to reach the same levels of functioning as younger adults even after extensive training (P. B. Baltes & Kliegl, 1992; Kliegl, Smith, & Baltes, 1990; T. Singer, Lindenberger, et al., 2003).

We submit that the three conditions and trajectories outlined in Figure 11.1 form a robust fabric, a biocultural, and because of its incompleteness, dynamic architecture of the life span (P. B. Baltes, 1997). This biocultural is not fixed, but subject to further processes of biocultural co-construction. We argue that the general script of this biocultural fabric represents a first tier of life span theory. They represent constraints on the degree of openess of the developmental life span system. Whatever the specific content and form of a given psychological theory of life span continuity and change, we maintain that it needs to be consistent with the frame outlined in Figure 11.1. For instance, we conclude that any theory of life span development positing "general" positive advances across broad domains of functioning in later adulthood is probably false.

The immediate future of old age, therefore, will depend to a large measure on our ability to generate and employ culture and culture-based technology in compensating for the unfinished architecture of biology, for the age-correlated decrease in biological functioning, for the growing gap between mind and body. In the long run, the changing dynamics in the relative impact of genome- and culture-based influences also suggests that interventions into the biogenetic system itself are necessary to generate more desirable states of aging, especially in the oldest-old. Biocultural co-construction is a concept that reflects the need for both biology and culture to cooperate in such aspirations (P. B. Baltes et al., 2006; P. B. Baltes & Singer, 2001; S.-C. Li, 2003).

Life Span Changes in the Relative Allocation of Resources to Distinct Functions of Development (Level 2)

Having characterized the overall biocultural landscape of human development, we move toward a level of organization closer to central concepts of developmental psychology. In Table 11.2, this was designated as Level 2. We take this next step by reflecting about functions (goals) and outcomes of development.

Growth versus Resilience (Maintenance) versus Regulation of Loss

To what degree does the overall biocultural architecture outlined in Figure 11.1 prefigure pathways of development and the kind of adaptive challenges individuals face as they move through life? One possibility is to distinguish between three functions of ontogenetic development. The first two are known from research in child development: *growth* and *resilience* (maintenance and recovery) of functioning (Cicchetti, 1993; Garmezy, 1991; Rutter, 1987). Life span researchers have added to these two functions that of management or *regulation of losses* (P. B. Baltes, 1987, 1997; Brandtstädter & Baltes-Götz, 1990; Brandtstädter & Greve, 1994; Brim, 1988; Dixon & Bäckman, 1995; Heckhausen & Schulz, 1993; Labouvie-Vief, 1982; Staudinger, Marsiske, & Baltes, 1993, 1995). This addition was invoked because, as the growing incompleteness of the biocultural architecture postulates, the foundational frame of lifelong development includes not only conditions of growth and health, but also conditions of permanent loss that, in principle, are not avoidable.

Figure 11.2 displays our general life span developmental script about the allocation of available resources for these three major adaptive tasks of growth, maintenance/recovery (resilience), and regulation of loss (P. B. Baltes, 1987; Staudinger et al., 1993, 1995). With the adaptive tasks of *growth,* we mean behaviors aimed at reaching higher levels of functioning or adaptive capacity. Under the heading of *maintenance* and *resilience,* we group behaviors which are aimed at maintaining levels of functioning in the face of challenge or returning to previous levels after a loss. With the adaptive task of management or *regulation of loss,* we identify those behaviors which organize adequate functioning at lower levels when maintenance or recovery, for instance, because of external-material or biological losses, is no longer possible.

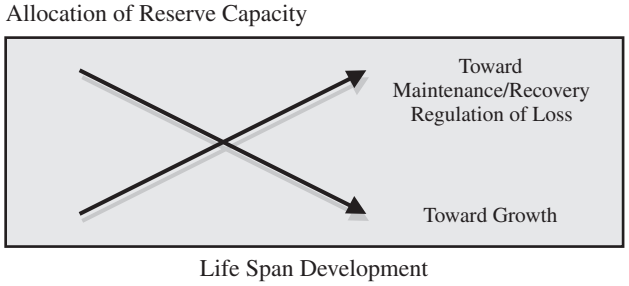


Figure 11.2 Life span changes in the allocation of resources into distinct functions (objectives) of development: growth, maintenance and recovery (resilience), and regulation (management) of loss. *Source:* From "Resilience and Reserve Capacity in Later Adulthood: Potentials and Limits of Development across the Life Span" (pp. 801–847), by U. M. Staudinger, M. Marsiske and P. B. Baltes, in *Developmental Psychopathology: Vol. 2. Risk, Disorder, and Adaptation,* D. Cicchetti & D. Cohen (Eds.), 1995, New York: Wiley.

In childhood and early adulthood, the primary allocation of resources is directed toward growth. During adulthood, allocation toward maintenance and recovery (resilience) is on the increase. Research by Freund and colleagues has shown that individuals of different ages hold mental scripts and preferences that are consistent with this life span change in the focus of allocation (Freund & Ebner, 2005; Riediger & Freund, in press). In advanced adulthood and especially in old age, more and more resources are directed toward regulation (management) of loss, although this need may not be realized as often as desired since the application of compensatory behaviors is effortful (P. B. Baltes & Baltes, 1990a; Freund & Baltes, 2002b). In old age, few resources remain available to be allocated to growth. Consistent with this general view, older adults invest more time into compensation than optimization (M. M. Baltes & Carstensen, 1996; Freund, in press). However, some targets for positive change continue to be realistic, such as advances in emotional and spiritual regulation or wisdom (P. B. Baltes & Staudinger, 2000; Carstensen, 1995; Carstensen, Isaacowitz, & Charles, 1999; Kunzmann, 2004; Staudinger, Freund, Linden, & Maas, 1999). Such a characterization is an oversimplification because individual, domain, and contextual differences need to be taken into account. Thus, the characterization is one about relative probability.

In our view (e.g., P. B. Baltes, 1987; Freund & Baltes, 2002b; Staudinger et al., 1995; for related arguments, see also Brandtstädter & Greve, 1994; Brim, 1992; Edelstein & Noam, 1982; Heckhausen, 1997; Labouvie-Vief, 1982), the life span shift in the relative allocation of biology- and culture-based resources to the functions of growth, resilience, and the management of loss is a major issue for any theory of life span development. This is true even for those theories that, on the surface, deal only with growth or positive aging (e.g., Erikson, 1959; Perlmutter, 1988; Ryff, 1984, 1989a). In Erikson's theory, for instance, the acquisition of generativity and wisdom are the positive developmental goals of adulthood. Despite the growth orientation of these constructs, even in Erikson's theory their attainment is inherently tied to recognizing and managing issues of generational turnover as well as of one's finitude and impending death. Another example is research on another facet of positive aging, wisdom (P. B. Baltes & Staudinger, 2000; Kunzmann & Baltes, 2003a, 2003b; Sternberg & Jordan, 2005). The expression of wisdom becomes more and more difficult as the oldest ages are reached, and its very content includes the recognition and mastery of the losses of life.

To illustrate this dynamic of coordinating in an adaptive manner facets of growth, maintenance, and regulation of loss, see Margret Baltes and her colleagues' research (M. M. Baltes, 1995, 1996; M. M. Baltes & Silverberg, 1994; M. M. Baltes & Wahl, 1992). This work focuses on the interplay between autonomy and dependency in different age groups including children and the old. While the primary focus of the first half of life is the maximization of autonomy, the developmental agenda changes in old age. In old age, to deal effectively with age-based losses and to retain some independence, the productive and creative use of dependency becomes critical. By invoking dependency and support, resources are freed for use in other domains involving personal efficacy and growth.

According to Margret Baltes, for older adults to maintain autonomy in select domains of functioning, the effective exercise and use of dependent behavior is a compensatory must. By invoking dependency and support, resources are freed up for use in other domains involving personal efficacy and growth. Furthermore, this program of research also showed that the three-fold developmental-function script is present in how others approach behavioral interactions with members of different age groups. In children, the primary script in the social world is one of supporting independence. The reverse (a dependency-support script) is true when interacting with older persons (M. M. Baltes, 1996).

In sum, a further step in developing life span theory is to recognize and specify the nature of the dynamics of individual as well as social resource allocation for growth, maintenance (resilience), and regulation of loss. Of particular importance is the nature of the shift in this systemic interplay and orchestration over the life course. Research presented later in this chapter on the theory of selective optimization with compensation (P. B. Baltes & Baltes, 1990a; Freund & Baltes, 2002a) will show how this general conceptual emphasis is translated into the study of specific domains such as cognition or motor behavior.

Deficits as Catalysts for Progress (Growth)

The attention given to the age-related weakening of the biological foundation in Figures 11.1 and 11.2 may have suggested that the consequences of such a loss in biological quality implies also a pervasive age-related loss in behavioral functioning, in other words, that there may be no opportunity for growth at all in the

second half of life in those domains where biological factors are important.

To prevent this possible misunderstanding, we next describe why this is not necessarily so, why deficits in biological status also can be the foundation for progress, that is, antecedents for positive changes in adaptive capacity. At least since the publication of "Limits of Growth" by the Club of Rome, there has been increasing public awareness that more is not always better and that progress is possible even in the context of limitations and constraints. Biocultural co-construction was already introduced as a metascript. Similar perspectives derive from considerations of the adaptive processes in evolution as well as from consideration of the function of compensation during ontogenesis (see also P. B. Baltes, 1991, 1997; Brandtstädter, Chapter 10, this *Handbook,* this volume; Dixon & Bäckman, 1995; Durham, 1991).

The most radical view of the notion that deficits can spell progress is contained in the notion of *culture as compensation.* That is, the condition of a limitation or a loss generates new forms of mastery and cultural innovation. As researchers study what is not yet known, cultural attention shifts to those areas where there is an objective or subjectively perceived lack or a deficit. In this line of thinking, the human organism is by nature a "being of deficits" (*Mängelwesen;* Gehlen, 1956) and social culture has developed or emerged in part to deal specifically with biological deficits.

Memorization strategies, for instance, were developed in part because human memory is not optimal. To give another example: The fact that humans are biologically vulnerable regarding outside temperatures (lack of perfect thermo-regulation) is among the reasons for a highly developed body of knowledge, values, and technology about textiles and clothing. This applies both to cultural evolution on the societal level and to individual ontogenesis. Research on psychological compensation is a powerful illustration of the idea that deficits can be catalysts for positive changes in adaptive capacity (Bäckman & Dixon, 1992; M. M. Baltes & Carstensen, 1996; P. B. Baltes & Baltes, 1990b; Dixon & Bäckman, 1995; Marsiske et al., 1995; Rowe & Kahn, 1987).

A Family of Metatheoretical Propositions about Life Span Developmental Theory (Level 3)

Because of the complexities associated with life span ontogenetic processes and the challenge involved in the articulation of adequate theoretical concepts, there has been much discussion in life span work about metatheory of development (e.g., P. B. Baltes, 1987; P. B. Baltes et al., 1980; Labouvie-Vief, 1980, 1982; R. M. Lerner, 1991, 2002; J. R. Nesselroade & Reese, 1973; Overton & Reese, 1973; Reese, 1994; Riegel, 1976). Included in this discussion was a continuing dialogue about the shortcomings of extant conceptions of development as advanced primarily by child developmentalists (e.g., Collins, 1982; Harris, 1957). A *family of metatheoretical propositions* intended to characterize the nature of life span development was one outcome of this extensive discussion (P. B. Baltes, 1979a, 1987; R. M. Lerner, 1983).

In the following discussion, we attempt to update this effort at a metatheory of life span development (Table 11.3). In doing so, we also point out that similar metatheoretical work exists in other quarters of developmental theory, particularly in conceptual work associated with cultural psychology, evolutionary psychology, and systems theory (see also Fischer & Bidell, Chapter 7; Gottlieb et al., Chapter 5; Thelen & Smith, Chapter 6, this *Handbook,* this volume). In the present context, however, we emphasize the uniqueness of the positions advanced by life span scholars.

Reformulating the Concept of Development from a Functionalist Perspective: Development as Change in Adaptive Capacity

From a life span theory point of view, it was important to articulate concepts of development that go beyond unidimensional and unidirectional models that had flourished in conjunction with the traditional biological conceptions of growth or physical maturation. In these traditional conceptions (Harris, 1957; Sowarka & Baltes, 1986), attributes such as qualitative change, ordered sequentiality, irreversibility, and the definition of an end state played a critical role. Primarily by considering ontogenetic development from a functionalist perspective (Dixon & Baltes, 1986), the traditional conception of development was challenged.

Development as Selection and Selective Adaptation (Optimization). The traditional concept of development emphasizes a *general* and *universal* development of an entity geared toward a higher level of functioning which, in addition, continuously incorporates most if not all previously developed capacities (Harris, 1957; R. M. Lerner, 1983, 2002; H. Werner, 1948). Historically, this view of ontogenetic development has been pictured as the unfolding and emergence of an entity,

TABLE 11.3 Family of Theoretical Propositions Characteristic of Life Span Developmental Psychology

Life span development: Ontogenetic development is a lifelong process that is co-constructed by biology and culture. No age period holds supremacy in regulating the nature of development.

Life span changes in the dynamic between biology and culture: With age and certainly after adulthood, there is a growing gap between biological potential and individual-cultural goals. This gap is fundamental to ontogenesis as the biological architecture of life is incomplete and inevitably results in loss of adaptive functioning and eventually death.

Life span changes in allocation of resources to distinct functions of development:growth versus maintenance versus regulation of loss: Ontogenetic development on a systemic level involves the coordinated and competitive allocation of resources in three distinct functions: (1) growth, (2) maintenance including recovery (resilience), and (3) regulation of loss. Life span developmental changes in the profile of functional allocation involve a shift from the allocation of resources for growth (more typical of childhood) toward an increasingly larger and larger share allocated to maintenance and management of loss.

Development as selection (specialization) and selective optimization in adaptive capacity: Development is inherently a process of selection and selective adaptation. Selection is due to biological, psychological, cultural, and environmental factors. Developmental advances are due to processes of optimization. Because development is selective and age-associated changes in potential, compensation is also part of the developmental agenda.

Development as gain/loss dynamic: In ontogenetic development, there is no gain without loss, and no loss without gain. Selection and selective adaptation are space-, context-, and time-bound. Thus, selection and selective adaptation imply not only advances in adaptive capacity but also losses in adaptivity for alternative pathways and adaptive challenges. A multidimensional, multidirectional, and multifunctional conception of development results from such a perspective.

Plasticity: Much intraindividual plasticity (within-person variability) is found in psychological development. The key developmental agenda is the search for the range of plasticity and its age-associated changes and constraints.

Ontogenetic and historical contextualism as paradigm: In principle, the biological and cultural architecture of human development is incomplete and subject to continuous change with biological and cultural factors, conditions, and co-constructing and modifying each other. Thus, ontogenetic development varies markedly by historical-cultural conditions. The mechanisms involved can be characterized as principles associated with biocultural contextualism. As an illustration, development can be understood as the outcome of the interactions (dialectics) between three systems of biological and environmental influences: (1) normative age-graded,
(2) normative history-graded, and (3) nonnormative (idiosyncratic). Each of these sources evinces individual differences and, in addition, is subject to continuous change.

Toward a general and functionalist theory of development: The effective coordination of selection, optimization, and compensation: On a general and functionalist level of analysis, successful development, defined as the (subjective and objective) maximization of gains and minimization of losses, can be conceived of as resulting from collaborative interplay among three components: (1) selection, (2) optimization, and (3) compensation. The ontogenetic pressure for this dynamic increases with age, as the relative incompleteness of the biology- and culture-based architecture of human development becomes more pronounced.

Updated from "Erfolgreiches Altern als Ausdruck von Verhaltenskompetenz und Umweltqualität" (pp. 353–377), by M. M. Baltes, in *Der Mensch im Zusammenspiel von Anlage und Umwelt,* C. Niemitz (Ed.), 1987, Frankfurt-am-Main, Germany: Suhrkamp; see also P. B. Baltes, 1987, 1997, and P. B. Baltes et al., 2006.

primarily formed from sources within that entity and by mechanisms of transformation or stage-like progression.

Such a unidirectional, growth-like view of human development appeared contradictory to many findings in life span psychology, which included negative transfer from earlier development to later developmental outcomes, differences in rates, age-onsets, and age-offsets of developmental trajectories, multidirectional patterns of age-related change, as well as discontinuities in prediction. Figure 11.3 represents an early representation of this differentiated view of development elicited by life span thinking and findings, which posed a challenge to traditional conceptions of development as unilinear and holistic growth (see also Labouvie-Vief, 1980, 1982).

Historically, one approach to this gap between theory and findings was to explore the usefulness of the distinction between development and aging (Birren, 1964). Life span theorists, at least within psychology, opted for a different strategy (P. B. Baltes, 1987). They attempted to either modulate the traditional definitional approach to development or to offer conceptions that highlighted the view that ontogenetic development was not identical with the notion of holistic and unidirectional growth. In these efforts, life span scholars shared the goal of reformulating the concept of development, although they differed in the degree of radicality and in specifics. Labouvie-Vief (1980, 1982; see also Pascual-Leone, 1983; Riegel, 1976), for instance, introduced new forms (stages) of systemic functioning for the period of adulthood, based on conceptions of development as adaptive transformation and structural reorganization, thereby opening a new vista on Neo-Piagetian constructivism. In our work (e.g., P. B. Baltes, 1983, 1987; P. B. Baltes et al., 1980), but also that of others such as Brandtstädter, Featherman, and Lerner (Brandtstädter, 1984; Featherman & Lerner, 1985; Featherman, Smith, &

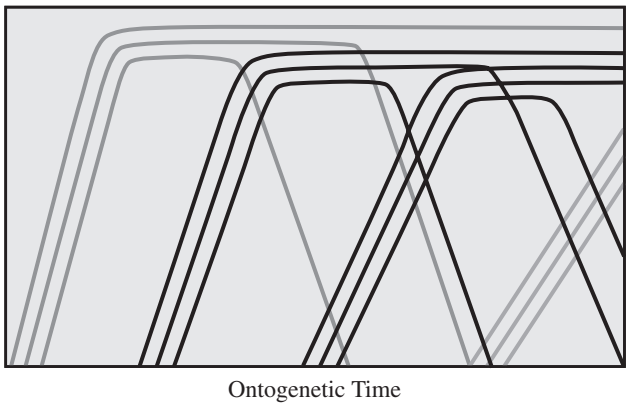


Figure 11.3 Hypothetical examples of life span developmental processes. Developmental functions (behavior-change processes) differ in onset, duration, termination, and directionality when charted in the framework of the life course. Moreover, developmental change is both quantitative and qualitative: Not all developmental change is related to chronological age, and the initial direction is not always incremental. *Source:* From "Plasticity and Variability in Psychological Aging: Methodological and Theoretical Issues" (pp. 41–66), by P. B. Baltes and M. M. Baltes, in *Determining the Effects of Aging on the Central Nervous System,* G. E. Gurski (Ed.), 1980, Berlin, Germany: Schering.

Peterson, 1990; R. M. Lerner, 1983), we were perhaps more radical in our departure from extant theoretical models of development. We attempted to approach the conceptualization of development by a theoretical framework of neofunctionalism (Dixon & Baltes, 1986) and contextualism (R. M. Lerner, 1991; Magnusson, 1996). Within that approach, the nature of adaptive change with life span development was driven by consideration of a larger set of influences and the kind of challenges that people face as their lives unfold. In our view, such a neofunctionalist approach was the most open to a full consideration of the new facets of ontogenetic change (such as multidirectionality, multifunctionality, adaptive specificities, and predictive discontinuity) that life span researchers were confronted with. At the same time, this broadened conception of development permitted maintaining traditional growth-like conceptions of development as a special class of developmental phenomena.

The result was to go beyond the traditional conception of development as growth and open the concept of development to a larger framework of changes. In our own work, we opted for defining development as *selective age-related change in adaptive capacity.* Development as selection and selective adaptation displays many attributes. For instance, it can be active or passive, conscious or subconscious, internal or external, and continuous or discontinuous. Moreover, in the long run or in different circumstances, it can be functional or dysfunctional.

This intellectual movement toward a broadly based functionalist conception of ontogenesis entailed a number of features. For instance, to reflect more accurately their understanding of the empirical evidence about life span changes, and also drawing from alternative conceptions of ontogenesis such as canalization and selective neuronal growth (Edelman, 1987; Waddington, 1975), self-organization (Barton, 1994; Maturana & Varela, 1980; Prigogine & Stengers, 1984), as well as expert systems (Chi, Glaser, & Rees, 1982; Ericsson & Smith, 1991; Weinert & Perner, 1996), life span researchers began to emphasize that any process of development is not foremost the unfolding of an entity. Rather, they focused on development as ontogenetic selection from a pool of more or less constrained potentialities and the subsequent selective optimization of the entered pathways including the construction of novel pathways that were not part of the original system (P. B. Baltes, 1987; Labouvie-Vief, 1982; Marsiske et al., 1995; Siegler, 1989). As a given pathway of ontogenetic development is chosen and optimized, others are ignored or suppressed. In short, some life span theorists ventured a new start and suggested treating ontogenetic development as a process of dynamic and selective adaptation reflecting the interaction of biological, cultural, and contextual factors as well as the proactive role of individuals in shaping their course of development (P. B. Baltes, Reuter-Lorenz, et al., 2006; Brandtstädter & Lerner, 1999). Thus, with the focus on selection and selective adaptation, life span researchers were able to be more open about the pathways of lifelong ontogenesis.

Development as a Gain-Loss Dynamic. Not surprisingly, a related change in emphasis advanced in life span theory and research was on viewing development as *always* being constituted by gains and losses (P. B. Baltes, 1979a, 1987; P. B. Baltes et al., 1980; Brandtstädter, 1984; Brim, 1992; Labouvie-Vief, 1980, 1982; J. Smith, 2003). Aside from functionalist arguments, there were several empirical findings that gave rise to this focus.

One example important to life span researchers was the differing life span trajectories proposed and obtained for the fluid mechanics and crystallized prag-

matics of intelligence (P. B. Baltes, 1993; Cattell, 1971; Horn, 1970; Horn & Hofer, 1992; S.-C. Li, Lindenberger, et al., 2004; McArdle, Ferrer-Caja, Hamagami, & Woodcock, 2002; Schaie, 1996, 2005). Very much in line with the life span dynamic between biology and culture expressed in Figure 11.1 (pp. 575), intellectual abilities that are thought to reflect the neurobiologically based mechanics of intelligence—like working memory and fluid intelligence—typically showed normative (universal) declines in functioning beginning in middle adulthood. Conversely, intellectual abilities that primarily reflect the culture-based pragmatics of intelligence—such as professional knowledge, language competence, and wisdom—may show stability or even increase into late adulthood. As to the ontogenesis of intelligence, then, gains and losses do co-exist.

Thus, as some life span theorists considered substituting the concept of an age-related selection-based change in adaptive capacity for the concept of development, one of the topics that motivated their agenda was the importance of viewing as fundamental to any ontogenetic change the notion of simultaneous gains and losses associated with these changes. From a functionalist point of view (Dixon & Baltes, 1986), it is more or less understood that changes in adaptive capacity can be positive or negative, that a given change in developmental capacity may imply different consequences depending on the outcome criteria and the adaptive contexts involved. Thus, the radical view was advanced that, contrary to traditional conceptions of development, there was *no gain in development without loss, and no loss without gain* (P. B. Baltes, 1987). Life span researchers, then, conceive of ontogenetic development not as a monolithic process of progression and growth, but as an ongoing, changing, and interacting system of gains and losses in adaptive capacity. Throughout life, development always consists of the joint occurrence of gains and losses, both within and across domains of functioning. Such an approach does not preclude that on some level of systemic analysis (i.e., considering the entirety of adaptive capacity in a fixed cultural context), ontogenetic development evinces an overall increase or decrease in adaptive capacity.

To strengthen the general case for reformulating the concept of development, life span researchers also suggested applying this multifunctional, multidimensional, and multidirectional view of development to the field of child development (P. B. Baltes, 1976, 1987; Labouvie-Vief, 1982). Consider as an example the ontogenesis of language recognition and language acquisition in childhood. When one language is acquired as mother tongue, sound recognition and sound production capacity for other languages decreases, especially if such second and third languages are acquired after early childhood (Levelt, 1989).

The study of tasks requiring probability-based imperfect rather than logic-based perfect solutions is another example (P. B. Baltes, 1987). The more advanced the cognitive status of children (in the sense of capacity for formal-logical reasoning), the less children are able to respond to cognitive problems that are essentially not perfectly solvable and therefore require the use of maximization rather than optimization strategies. Weir (1964) conducted an early critical experiment on this question in the domain of probability-based learning. In probability learning tasks without perfect solutions, there is the seemingly paradoxical finding that very young children outperformed older children and college students. Considering adaptive trade-offs between levels (stages) of cognitive functioning, this finding becomes meaningful. It is likely that the older children and young adults achieved lower performance outcomes because they understood the experimental task as a logical problem-solving task and, therefore, continued to employ task-inappropriate but developmentally more "advanced" cognitive strategies aimed at "perfect" optimization.

In retrospect, it is perhaps not surprising that the gain-loss dynamic was identified primarily by life span researchers as a central topic of ontogenetic analysis. On the one hand, life span researchers, because of their concern for long-term processes, were pushed toward recognizing the varied forms of developmental change associated with cultural evolution. On the other hand, on a subjective-phenomenological level, the issue of gains and losses becomes more conspicuous as one considers adult development and aging. In this phase of life, declines and losses, especially those due to biological aging, are difficult to ignore.

Recently, one additional concept has been advanced to characterize the nature of life span changes in adaptive capacity. This concept is *equifinality.* Equifinality highlights the fact that the same developmental outcome can be reached by different means and combination of means (Kruglanski, 1996). The role of equifinality (a related notion is the concept of overdetermination) is perhaps most evident when considering the many ways by which individuals reach identical level of subjective

well-being (P. B. Baltes & Baltes, 1990b; Brandtstädter & Greve, 1994; Staudinger et al., 1995). Other examples come from research on goal attainment conducted in the framework of action psychology (Brandtstädter, Chapter 10, this *Handbook,* this volume; Gollwitzer & Bargh, 1996). In this approach, researchers have distinguished between two general categories of equifinality: equifinality associated with contextual (contingency) match and equifinality based on substitutability (Kruglanski, 1996). In life span research, notions of equifinality are important, for instance, when attempting to speak of general-purpose mechanisms and ways to compensate, both in the domains of intelligence and personality. The potential for developmental impact is larger if the resources acquired during ontogenesis in the sense of equifinality carry a broad scope of generalization and use in rather different contexts.

A Focus on Plasticity and Age-Associated Changes in Plasticity

Arguably, plasticity is the concept most emphasized by life span researchers (P. B. Baltes & Schaie, 1976; P. B. Baltes & Willis, 1982). Note that plasticity does not refer to complete or arbitrary malleability of behavior. Rather, it denotes that behavior is always open and constrained at the same time. Hence, the focus on plasticity highlights the search for the potentialities of development including its boundary conditions. This notion of plasticity also implies that any given developmental outcome is but one of numerous possible outcomes, and that the search for the conditions and ranges of ontogenetic plasticity, including its age-associated changes, is fundamental to the study of development. Taken to the extreme, the notion of plasticity can be taken to challenge the conceptual foundation of any genetically based fixity in ontogenesis including the notion of an immutable norm of reaction (see also Gottlieb, 1998). While such vistas are intellectually stimulating, they are likely overextending the scope of the empirical evidence as well as the constraints of evolutionary theory (Hagen & Hammerstein, 2005). The very concept of plasticity of biological plasticity depends on genetically based prerequisites and related constraints for life and its developmental course.

For several reasons, life span researchers increasingly moved in the direction of making the study of plasticity a cornerstone of their metatheoretical posture and empirical work. In retrospect, we emphasize three such reasons. First, as many life span researchers did work in the field of aging, plasticity-related ideas were invoked to counteract the prevailing negative stereotype of aging as a period of universal decline with no opportunity for positive change (P. B. Baltes, 1987; P. B. Baltes & Labouvie, 1973; P. B. Baltes & Willis, 1977; Labouvie-Vief, 1977; S.-C. Li, 2003; Perlmutter, 1988). Thus, when aging researchers demonstrated in intervention-oriented research the enhancement possibility of the aging mind, even in domains such as fluid intelligence and memory in which decline was the norm, this was counterintuitive evidence. Such evidence made clear that aging, as we observe it today, is but one expression of what is possible in principle. It makes conspicuous why the intellectual and societal project of constructing aging is still in the making (P. B. Baltes, 1987, 1997; Rowe, 1997).

Second, the concept of plasticity accentuated that life span development does not follow a highly constrained (fixed) course, especially when culture- and knowledge-based phenotypic expressions are concerned. Thus, the focus on plasticity brought into the foreground that "humans have a capacity for change across the life span from birth to death . . . [and that] the consequences of the events of early childhood are continually transformed by later experiences, making the course of human development more open than many have believed" (Brim & Kagan, 1980, p. 1). Such views of lifelong plasticity have become prominent in biological quarters as well (e.g., Cotman, 1985; Finch & Zelinski, 2005; Kempermann, in press).

Third, the concept of plasticity opens new vistas on interdisciplinary perspectives. A view, more recently developed (P. B. Baltes et al., 2006) is that the basic questions of plasticity can be linked to similar concepts in the social sciences. Thus, the insistence on lifelong plasticity in human development is also consistent with the argument advanced most prominently by social scientists that much of what happens in the life course is a direct reflection of the goals, resources, and norms of a given society and that societal contexts differ in the structure, emphases, and sequential ordering of such factors (Brim & Wheeler, 1966; Mayer, 1990; Riley, 1987; Settersten, 2005). For this purpose, Figure 11.4 specifies three types of plasticity: neuronal/bodily, behavioral, and societal (see also P. B. Baltes & Singer, 2001; Baltes, Reuter-Lorenz, & Rösler, 2006; S.-C. Li, 2003; S.-C. Li & Linderberger, 2002).

Neuronal/bodily, behavioral, and societal plasticity, as defined in Figure 11.4, form a frame within which the contributions to questions of potential and its realiza-

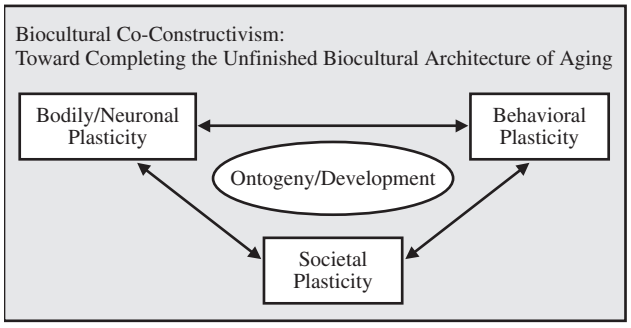


Figure 11.4 Each of the major scientific disciplines concerned with human development have developed a focus on plasticity to understand mechanisms and variations in outcomes: Genetic/neuronal/bodily, behavioral, and societal plasticity are important examples. *Research Report of the Max Planck Institute for Human Development,* 2003–2004. See P. B. Baltes, P. Reuter-Lorenz, & F. Rösler, 2006, for further elaboration.

tion offered by the various life, behavioral, and social sciences engaged in the study of human development can be understood and interrelated. Each of the components depicted does not operate in isolation. Rather, in the sense of biocultural constructivism they interact and modify each other.

Research on neuronal/bodily plasticity uses outcomes such as neurogenesis, synaptic powering, and other indicators of brain differentiation to represent individual brain development and interindividual differences therein. Work on behavioral plasticity highlights outcomes on the level of mind and behavior associated with differing conditions of life experiences, including cognitive practice. Societal plasticity illustrates variations at the macrolevel (e.g., resources and norms associated with gender, social class, ethnicity, etc.) and the role of social constraints and opportunities. Relevant evidence is typically collected by comparative social-science work on groups or nations rather than individuals and on theories of societal influences (e.g., norms, socialization) that shape developmental trajectories and their social differentiation. A societal plasticity perspective presumes that individuals belonging to different groups have similar potentialities which, however, are realized to different degrees and qualities (see also Settersten, 2005).

Returning to developmental psychology: As work on individual behavioral plasticity progressed and showed large variation in developmental manifestations, the concept of plasticity became a mental script that supported the general idea of development as being more open and pluralistic than traditional views of behavioral development during childhood and beyond seemed to suggest. Thus, the concept of plasticity highlighted the metatheoretical posture *that any course of development is but one of a pool of potentialities;* that the "nature" of human development is not fixed; and that (aside from the fact of finitude) there is no single end state to human development.

The perhaps most important line of inquiry was the quest for understanding interindividual differences and *age-related developmental changes in plasticity.* While plasticity as a phenomenon was extended beyond childhood, there were theoretical and empirical reasons why plasticity should not be age-less but changing with age. Thus, the search for the range of plasticity resulted not only in evidence for malleability and plasticity; it also produced new evidence on individual and age-based constraints in the range (norm of reaction) of possible development (P. B. Baltes & Lindenberger, 1988; Kliegl et al., 1990; Plomin & Thompson, 1988). In work on cognitive aging, for instance, the goal was to learn about maximum potential in different age groups.

This line of inquiry suggested different facets of behavioral/developmental plasticity. One was the differentiation between *baseline reserve capacity* and *developmental reserve capacity.* Baseline reserve capacity identifies the current level of plasticity available to individuals. Developmental reserve capacity is aimed at specifying what is possible in principle if optimizing interventions are employed to test future ontogenetic potential. Furthermore, major efforts were made to specify the kind of methodologies, such as developmental simulation, testing-the-limits, and cognitive engineering, that lend themselves to a full exploration of ontogenetic plasticity and its limits (P. B. Baltes, 1987; P. B. Baltes & Willis, 1982; Kliegl & Baltes, 1987; Kliegl, Mayr, & Krampe, 1994; Lindenberger & Baltes, 1995b).

Within the frame of sizeable plasticity, then, the expression of human development is a matter of collaboration and co-construction between different factors and mechanisms. Indeed, an increasingly more full-blown constructivist perspective on human potentialities has become a modern theme of developmental research (Aspinwall & Staudinger, 2003; P. B. Baltes et al., 2006; P. B. Baltes & Smith, 2004; Brandtstädter & Lerner, 1999; S.-C. Li, 2003; S.-C. Li & Lindenberger, 2002). With a constructivist perspective one highlights the notion that human development is

constructed by the interplay of biological, psychological, and social forces. Part of this construction relies on agentic behavior of individuals. Individuals are contributors to their own development. The resulting concept is that of *developmental biocultural co-constructivism* (P. B. Baltes, Freund, & Li, 2005; P. B. Baltes & Smith, 2004; S.-C. Li, 2003). With the advent of biocultural co-constructivism, the quest for interdisciplinary collaboration has attained a new state of urgency. In our view, the life span approach with its emphasis on viewing the conditions of human development as historically incomplete and more open than traditionally assumed has been a major partner in advancing this intellectual position.

Ontogenetic and Historical Contextualism as Paradigm

Highlighting the notion of plasticity as a cornerstone of life span research on human development alludes to another key feature of life span metatheory, the paradigm of contextualism. In evolutionary selection theory and the evolutionary basis of adaptive fitness, the role of context is paramount. Recently, P. B. Baltes and Smith (2004) have shown how modern versions of contextualism include the perspective of biocultural co-constructivism to avoid the idea that context is strictly environmental in origin.

Therefore, as developmental psychologists attempted to move beyond microgenetic representations of the learning process as a marker of experience to capture context as a system of influence, they engaged themselves into metatheoretical perspectives on contextualism. Such a contextualist view, rather than a focus on "mechanist" or "organismic" models of development (Overton & Reese, 1973; Reese & Overton, 1970), evolved with force in the 1970s (Datan & Reese, 1977; Riegel, 1976), and as already described in the preceding section, it continues into the present. This approach was similar to the evolution of ecological-contextualist perspectives offered by cultural psychology (Bronfenbrenner, 1977; Bronfenbrenner & Ceci, 1994; Cole, 1996).

According to contextualism and also action theory (see Brandtstädter, Chapter 10, this *Handbook,* this volume), individuals exist in contexts that create both special opportunities for, and limitations to, individual developmental pathways. Delineation of these contexts in terms of macrostructural features, like social class, ethnicity, roles, age-based passages and historical periods, is a major goal for the sociological analysis of the life course (e.g., Elder, 1994; Elder & Shanahan, Chapter 12, this *Handbook,* this volume; Heckhausen, 2000; Kohli & Meyer, 1986; Mayer, 2003; Riley, 1987; Settersten, 2005). In fact, this was a time when sociologists and developmental psychologists attempted to interrelate their various endeavors (e.g., Sorensen, Weinert, & Sherrod, 1986). For life span psychologists, and perhaps also for child developmentalists (P. B. Baltes, 1979b), this dialogue opened their vista on the scope, temporal patterning, and differentiation of biological and social forces (incidentally much instigated by various committees on human development arranged by the U.S. Social Science Research Council).

A Macro-Model of Developmental Influences

During this time of intensive collaboration between life course sociologists (e.g., Riley et al., 1972) and life span psychologists, the first author and his colleagues (P. B. Baltes, Cornelius, & Nesselroade, 1979; P. B. Baltes et al., 1980) proposed a heuristic model that attempted to integrate biological, sociological, and psychological considerations in one framework in order to understand the entire fabric of development-producing contexts: Three biocultural components were considered at the foundation of human ontogeny: *Normative age-graded influences, normative history-graded influences,* and *nonnormative (idiosyncratic)* influences. Normative in this context refers to a high degree of generality. Nonnormative factors highlight the more individualized conditions such as winning in a lottery.

To understand a given life course, and interindividual differences in life course trajectories, this model suggests that it is necessary to consider the operation and interaction among these three classes of influences (Figure 11.5). Note that these sources contribute to similarities in development, but also, because they exist in systematic group variations, for instance by social class, genetic dispositions, and ethnicity, they also contribute to systematic interindividual variations and subgroup-specific patterns of life span development (P. B. Baltes & Nesselroade, 1984; Dannefer, 1989; Riley et al., 1972).

Age-graded influences are those biological and environmental aspects that, because of their dominant age correlation, shape individuals in relatively normative ways for all individuals. Consider the temporal and domain structure of life span developmental tasks (Havighurst, 1948), the age-based process of physi-

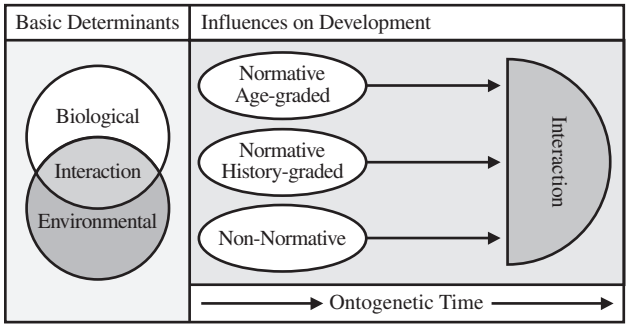


Figure 11.5 Representation of the operation of three major biocultural influence systems on life span development: (1) normative age-graded, (2) normative history-graded, and (3) nonnormative life events. These influence systems vary in their level and interactions for different individuals and for different behaviors. As a whole, the operation of these systems produces commonalities and individual differences in ontogenesis. *Source:* From "Plasticity and Variability in Psychological Aging: Methodological and Theoretical Issues" (pp. 41–66), by P. B. Baltes and M. M. Baltes, in *Determining the Effects of Aging on the Central Nervous System,* G. E. Gurski (Ed.), 1980, Berlin, Germany: Schering.

cal maturation, or the sequential arrangement of developmental contexts (family, school, work, etc.) as examples.

History-graded influences are those biological and environmental aspects that may make ontogenetic development different across historical cohort and periods. Consider the historical evolution of the educational and professional system as an example, or, for a more punctuated period-specific example, the advent of a war. Thus, a given ontogeny proceeds at the same time in the contexts of age-based ontogenetic time as well as historical cohort time. This position has been argued most fervently by Matilda Riley (1987). In the early phases of life span psychology, research on birth-cohort effects has made the strongest case for consideration of historical contextualism (Elder, 1974, 1990; J. R. Nesselroade & Baltes, 1974; Schaie, 1965, 1996). The topic of historical embeddedness, and the extricating of age-based versus cohort-based differences in ontogenetic development, was also the foundation for the formulation of new developmental methodologies such as cross-sectional and longitudinal sequences (see the following discussion).

Nonnormative influences on development, finally, reflect the individual-idiosyncratic biological and environmental events that, while not frequent, can have powerful influences on ontogenetic development (Bandura, 1982; Brim & Ryff, 1980). The influence of these nonnormative events (such as winning a lottery, losing a leg in an accident) is especially powerful because they generate conditions that are less predictable, less amenable to social control and support, and therefore may represent extreme situations of challenge (approaching testing-of-limits), not unlike the concept of *Grenzsituation* introduced by the philosopher Karl Jaspers (Kruse, 1992; Maercker, 1995).

In life span theory, these three sources of influence create the contexts within which individuals act, react, organize their own development, and contribute to the development of others. None of these patterns of biologically and environmentally based influences is likely to operate independently from the other. They are part of biocultural co-construction with reciprocal and modifying influences. Such a focus on the dynamics of biocultural co-construction also makes explicit the lack of full predictability of human development as well as the boundedness that individuals experience as they engage in the effort to compose and manage their lives (Brandtstädter, 1984; Brandtstädter & Lerner, 1999; R. M. Lerner, 1984, 1991). And finally, such a focus on contextualism places individual development in the context of the development of others. It is not surprising, therefore, that life span researchers have easily embraced concepts such as collaborative development, collaborative cognition, or interactive minds (P. B. Baltes & Staudinger, 1996a; Resnick, Levine, & Teasley, 1991). However, what remains underdeveloped in life span psychology is the empirical counterpart to this theoretical position. Only more recently have we witnessed research efforts to include these contextual- and social-interactive approaches in the study of interactive networks such as communities of learning (Mandl, Gruber, & Renkl, 1996), life course convoys (Kahn & Antonucci, 1980), mentors (Bloom, 1985), cohort formations (Riley, 1987), kinship relationships (Hammerstein, 1996), cohort-related changes in education and health (Schaie, 1996, 2005), the role of neighborhoods, or changing policies in retirement and elderly care.

Methodological Developments

Life span research opened new territories and because of the temporal, contextual, and historical complexities involved required much attention to developmental methodology (P. B. Baltes, Reese, & Nesselroade, 1988; Cohen & Reese, 1994; Hertzog, 1985; Magnusson, Bergman, Rudinger, & Törestad, 1991; J. R. Nesselroade

& Reese, 1973). In our view, this concern about adequate methodology was so important to life span researchers because their orientation toward long-term ontogenetic processes and linkages and the decomposition of the biocultural dynamic represented an extreme challenge to the goals and methods of developmental analysis.

From Cross-Sectional to Longitudinal to Sequential Methodology. A first example is the development of methods appropriate to the study of age-related change, interindividual differences in age-related change, and the role of historical changes in the contexts of development. Traditionally, the main designs used in developmental psychology were the cross-sectional and the longitudinal method (P. B. Baltes & Nesselroade, 1978, for historical review). The focus on the interplay between age-graded, history-graded, and nonnormative factors suggested, however, that such methods were insufficient (P. B. Baltes, 1968; N. B. Ryder, 1965; Schaie, 1965). This challenge to track both historical and individual-ontogenetic change resulted in the formulation of so-called sequential methods (P. B. Baltes, 1968; Schaie, 1965, 1996, 2005).

Figure 11.6 depicts the basic arrangement of what Schaie and Baltes (1975) have come to label as *cross-sectional* and *longitudinal sequences.* Cross-sectional sequences consist of successions of cross-sectional studies; longitudinal sequences of successions of longitudinal studies. When applied in combination, the two types of sequential designs produce, on a descriptive level, exhaustive information about age- and cohort-related change as well as about interindividual differences in change trajectories. The sequential design also permits the identification of punctuated historical effects, so-called period effects. In contrast to cohort effects, which extend over longer time spans of historical change (such as effects associated with mass education or the introduction of computer technology), the concept of period effects is typically applied to more transient historical events and their consequences, such as a natural catastrophe or a war.

There is much research in human development that has demonstrated the important role of historical cohort effects. Schaie (1996, 2005), for instance, has compared both in cross-sectional and longitudinal sequences the adult-age development of several birth cohorts from 1956 to the present and presented impressive evidence that, during middle adulthood, cohort effects can be as

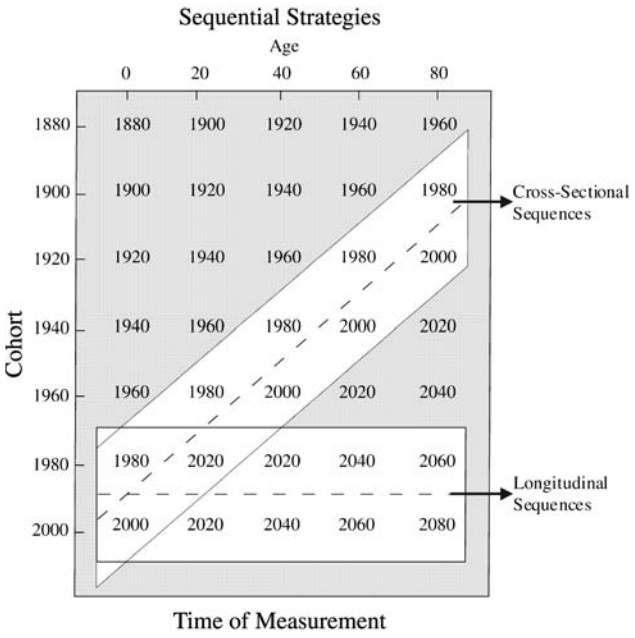


Figure 11.6 Illustration of cross-sectional and longitudinal sequences (bottom). *Source:* From "Longitudinal and Cross-Sectional Sequences in the Study of Age and Generation Effects" by P. B. Baltes, 1968, *Human Development, 11,* pp. 145–171; From "A General Model for the Study of Developmental Problems" by K. W. Schaie, 1965, *Psychological Bulletin, 64,* pp. 92–107.

large as age effects. Schaie's work has also shown that the directionality of age and cohort gradients can differ. Similarly, J. R. Nesselroade and Baltes (1974), in an early application of longitudinal sequences to the study of adolescence, presented evidence that personality development during adolescence in such measures as achievement and independence evinced major cohort differences over time intervals as short as 2 years. Their interpretation focused on the role of the Vietnam War as the critical modulator variable and its impact on U.S. youth culture, including how adolescents changed in their developmental personality gradients.

Meanwhile, through application of sequential methods, there is a large body of evidence on cohort effects available in developmental psychology, but especially in comparative sociology; evidence that makes explicit one of the important ingredients to life span theory, namely, the interplay between individual development and a changing society (cf. Elder & Shanahan, Chapter 12, this *Handbook,* this volume; Settersten, 2005). Also important in this work is the growing recognition of when cohort ef-

fects are likely to be relevant and when not. For instance, life span researchers now distinguish between at least three types of cohort effects requiring different kinds of interpretative efforts (J. R. Nesselroade & Baltes, 1979): (1) cohort as a *theoretical process* denoting historical change that alters fundamental aspects of human ontogeny (e.g., changing gender roles); (2) cohort as a *dimension of quantitative generalization* (e.g., higher levels of cognitive skills due to an increase in education); and (3) cohort as a *transitory disturbance* (e.g., fluctuant changes in attitudes due to singular events as often reported in opinion survey research).

In part as a response to the growing availability of longitudinal and sequential data sets, methodologists from different research traditions including life-span psychology have refined and expanded statistical methods for the study of interindividual differences in developmental trajectories (Baltes, Reese, & Nesselroade, 1977; for a recent overview, see Hertzog & Nesselroade, 2003). Various longitudinal modeling techniques such as multilevel modeling, latent growth curve modeling, and latent difference score modeling allow researchers to examine the structure of interindividual differences in change (e.g., Ghisletta & Lindenberger, 2004). These methods attenuate complications commonly associated with change scores such as lack of reliability (e.g., Cronbach & Furby, 1970), and some of them, such as multivariate extensions of the dual change score model, permit testing of dynamic hypotheses linking one aspect of behavior to changes in another aspect (e.g., McArdle, Hamagami, Meredith, & Bradway, 2000; for applications to changes in intellectual and sensory functioning, see Ghisletta & Lindenberger, 2005). A related methodological development spurred on by life-course sociologists, in particular, concerns methods to organize and study the temporal flow, correlates, and consequences of life events. Models of event-history analysis and associated methods such as hazard rate analysis are especially important (Blossfeld, Hamerle, & Mayer, 1991; Blossfeld & Rohwer, 2001; Featherman & Lerner, 1985; Greve, Tuma, & Strang, 2001; Magnusson et al., 1991; Schaie, 1988; Willett & Singer, 1991). Note, however, that advanced statistical methods for analyzing multivariate longitudinal change often are based on strong assumptions such as sample homogeneity, in general, and cross-sectional/longitudinal convergence, in particular. Also, the psychometric properties of these methods have not yet been fully explored and understood (Hertzog, Lindenberger, Ghisletta, & Oertzen, 2004).

.

The Experimental Simulation of Development. A further strategy developed primarily by life span researchers is the explicit use of simulation paradigms in the study of human development. Again, use of such an approach was enhanced by the fact that life span ontogenetic processes are time-extensive and, therefore, difficult to study without simulation (P. B. Baltes & Goulet, 1971; Lindenberger & Baltes, 1995b).

Table 11.4 summarizes the approach of developmental simulation. In a general sense, the experimental simulation approach is a theory-testing device that arranges for conditions thought to be relevant for the phenomenon of interest. Thus, experimental developmental simulations simulate or mimic variations that are thought to exist in real-time and real-world ontogenesis. As a research strategy, the design of developmental simulation consists of a coordinated sequence of seven steps that, however, do not need to be performed in the sequence specified. A developmental phenomenon is considered to be well understood if knowledge based on all steps is available.

In life span research, such simulations have been used, for instance, to examine the effects of aging-associated changes in sensory input. For this purpose, auditory and visual acuity of adults was reduced to the level of older

TABLE 11.4 The Logic of Experimental Simulation in the Study of Development: A Coordinated Sequence of Steps

1	Definition and description of target developmental phenomenon to be studied
2	Postulation of a causal hypothesis or causal structure about underlying mechanisms and contextual conditions
3	Experimental manipulation of relevant variables in the laboratory
4	Test of experimental data against target phenomenon: isomorphism check
5	Reexamination of causal hypothesis or causal structure (confirmation/rejection/modification) and search for alternative explanations
6	Evaluation of external validity: Descriptive evidence
7	Evaluation of external validity: Interventive evidence

Source: Modified from "Testing-the-Limits and Experimental Simulation: Two Methods to Explicate the Role of Learning in Development," by U. Lindenberger and P. B. Baltes, 1995b, *Human Development, 38,* pp. 349–360; and *Life-Span Developmental Psychology: Introduction to Research Methods,* by P. B. Baltes, H. W. Reese, and J. R. Nesselroade, 1988, Hillsdale, NJ: Erlbaum. Reprint of the 1977 edition.

persons and then tested for cognitive performance (Dickinson & Rabbitt, 1991; Lindenberger, Scherer, & Baltes, 2001). Another example is a research program by Margret Baltes on the many faces of dependency and autonomy in old age (1988, 1996; M. M. Baltes & Wahl, 1992). In this research program, the key questions were concerned with the conditions and range of autonomy and dependence including their multifunctional characteristics and plasticity.

The opening steps (1 to 3 in Table 11.4) of this research on autonomy and dependency in old age conducted by Margret Baltes and her colleagues were observations in the living environments of elders concerning their transactions with others. Negative aging stereotypes were assumed to play a major role in the observed age-associated emergence of dependent rather than independent behavior. To examine this hypothesis, a series of experimental laboratory studies were conducted to explore the effects of learning conditions (stimulus control, practice, reinforcement schedules) on self-care behavior in older adults. This work demonstrated that many aspects of older adults' dependent behaviors were found to be reversible, supporting the notion that environmental factors (e.g., behavioral contingencies) exert some influence on the aging-associated emergence of dependency or loss of autonomy. In subsequent work, reflective of steps 4 to 6 in Table 11.4, Margret Baltes and her colleagues observed the social conditions surrounding the occurrence of self-care in the elderly in the natural environment. Supportive of their position, a dependency-support script and an independence-ignore script were identified. In other words, social partners of older persons in the context of self-care exhibited a high frequency of behaviors indicative of support of dependence. Finally, research was conducted to manipulate the relevant causal variables in the natural environment of older persons. For this purpose, the researchers (see M. M. Baltes, 1996; M. M. Baltes, Neumann, & Zank, 1994) intervened in the social environment of older persons in nursing homes. This was done by training nursing home staff to downplay the dependence-support script, and to move toward an independence-support script. By and large, these changes in the natural environment resulted in the expected outcome. Older persons displayed a higher level of independence in self-care.

Researchers interested in more narrow age spectrums use similar strategies of experimental simulation of development (Siegler, Chapter 11, this *Handbook,* Volume 2). However, we claim that life span researchers are particularly dependent on the creative use of such arrangements; and, moreover, that life span researchers are especially aware of the many methodological limitations (such as lack of measurement equivalence, isomorphy, and external validity) associated with such and with other age-comparative research. The explicit use of the term of simulation to denote these limitations underscores this awareness.

Testing-the-Limits. An additional example of methodological innovations involves a strategy that life span researchers have developed to examine the scope and limits of behavioral *plasticity* (P. B. Baltes, 1987; Kliegl & Baltes, 1987), another key aspect of the family of propositions advanced in life span theory. This method is similar to efforts in child development to study the zone of proximal development, for instance, through methods of microgenetic analysis or cognitive engineering (Brown, 1982; Kliegl & Baltes, 1987; Kuhn, 1995; Siegler & Crowley, 1991).

Again, because of the long timeframe of life span ontogenesis, it is very difficult in life span research to identify the sources and scope of intraindividual plasticity (malleability) and its age-related changes. At the same time, one key question for life span researchers is: What is possible in principle in human development across the life span? One of the perennial questions of cognitive aging researchers, therefore, was whether aging losses in functions reflect experiential practice deficits with cognitive activities rather than effects of biological aging (P. B. Baltes & Labouvie, 1973; Denney, 1984; Salthouse, 1991; Willis & Baltes, 1980).

The resulting method has been labeled the *testing-the-limits paradigm* (Kliegl & Baltes, 1987; Lindenberger & Baltes, 1995b; Schmidt, 1971). In testing-the-limits research, the goal is to compress time by providing for high density developmental experiences; and by doing so to arrange for the best conditions possible and to identify asymptotes of performance potential (plasticity). These asymptotes, obtained under putatively optimal conditions of support, are expected to estimate the upper range of the age-specific developmental potentiality comparable to the traditional notion of the upper limit of the "norm of reaction." The use of testing-the-limits procedures has generated new insights into what is and what is not possible in development.

Testing-the-limits research, however, is not only relevant for the study of long-term ontogenetic processes. It is equally relevant for other important aspects of developmental research and theory. Two examples illustrate this. The first is the question of sex or gender differences in cognitive functioning. What would be most necessary is to depart from simple, noninterventive comparative research and to invest scientific resources into testing-the-limits work. A testing-the-limits approach would be based on the premise that the relevant information is knowledge about differences in asymptotic (peak) levels of functioning. Small, carefully selected samples could be used for this purpose (e.g., P. B. Baltes & Kliegl, 1992; Kliegl & Baltes, 1987; Lindenberger, Kliegl, & Baltes, 1992). The same perspective would hold true for another hotly debated topic; that is, research into genetic differences. Rather than investing most of the available resources into largely descriptive behavior-genetics studies, an alternative would be to expose smaller samples of participants to time-compressed experiential interventions and to search for interindividual differences at the upper or lower levels of functioning (e.g., S.-C. Li, Huxhold, & Schmiedek, 2004; Lindenberger & Oertzen, in press).

An Example of a Systemic and Overall Theory of Life Span Development: Selective Optimization with Compensation (Level 4)

Next, we take one further step toward a more psychological level of analysis of the nature of life span development. For this purpose, we describe a model of development, selective optimization with compensation (SOC), which Margret Baltes, Paul Baltes, and their colleagues have developed over the past decade (M. M. Baltes, 1987; M. M. Baltes & Carstensen, 1996; P. B. Baltes, 1987; P. B. Baltes & Baltes, 1980, 1990b; P. B. Baltes, Dittmann-Kohli, & Dixon, 1984; Freund & Baltes, 2002b; S.-C. Li & Freund, 2005; Marsiske et al., 1995; Riediger, S.-C. Li, & Lindenberger, in press; see also Featherman et al., 1990). This model offers a systemic view of human development across the life span involving many of the features of life span development presented in the previous sections. Heckhausen and Schulz (1995; Schulz & Heckhausen, 1996) developed a similar model. Finally, the notion of *vicariance,* prominent in francophone differential and developmental psychology (e.g., Lautrey, 2003; cf. Reuchlin, 1978), bears much resemblance to the notion of compensation in SOC theory.

The SOC model in its generality is still located at a level of analysis that is distant from specific theory. Thus, as the model is applied to specific domains of psychological functioning (such as autonomy or professional expertise), it requires further specification to be derived from the knowledge base of the domain of functioning selected for application (e.g., Abraham & Hansson, 1995; B. B. Baltes & Heydens-Gahir, 2003; M. M. Baltes & Lang, 1997; Featherman et al., 1990; Freund & Baltes, 1998, 2002b; S.-C. Li & Freund, 2005; Marsiske et al., 1995). At the same time, however, because of this generality in formulation, the model of SOC is rather open as to its deployability and domain-specific refinement.

In principle, the theory of SOC is considered a general theory of proactive and adaptive development (P. B. Baltes, 1997; Li & Freund, 2005). As a general theory of development, it pursues two objectives: First, an account of how developmental resources are *generated,* and second, how resources once they are developed are *allocated* to master the tasks of life including in situations where resources are insufficient.

Definition of Selection, Optimization, and Compensation

As mentioned earlier, we proceed from the assumption that any process of development involves selection and selective changes in adaptive capacity (P. B. Baltes, 1987; Featherman et al., 1990; Freund & Baltes, 2002b; Krampe & Baltes, 2003; Marsiske et al., 1995). Selection from a potential pool of developmental trajectories makes directionality in development and higher levels of functioning possible. We further assume that for selection to result in successful development (maximization of gains while minimizing losses), it needs to work in conjunction with processes of optimization and compensation.

If approached within an action-theoretical framework, which is only one of the many possible theoretical frames, the following characterizations of the three components hold: *Selection* involves goals or outcomes; *Optimization* involves goal-related means to achieve success (desired outcomes); and *Compensation* involves a response to loss in goal-relevant means in order to maintain success or desired levels of functioning (outcomes). Table 11.5 summarizes this approach and offers as illustrations items from a study on proverbs and items from a self-report measure developed to assess

TABLE 11.5 Selection, Optimization, and Compensation: Brief Definitional Frames and Examples from Proverbs and Questionnaire Items

Strategy	Role in Development	Sample Proverb (Freund & Baltes, 2002a)	Sample Questionnaire Item (Freund & Baltes, 2002b)
Selection1[a]	Concerns directionality and focus of developmental outcomes such as goals.	Jack-of-all-trades, master of none.	I always focus on the most important goal at a given time.
		Those who follow every path, never reach any destination.	When I think about what I want in life, I commit myself to one or two important goals.
		Between two stools you fall to the ground.	To achieve a particular goal, I am willing to abandon other goals.
Optimization	Concerns the acquisition and refinement of means and their coordinaton to achieve goals/outcomes.	Practice makes perfect.	I keep working on what I have planned until I succeed.
		If at first you don't succeed, try, try, and try again.	I keep trying until I succeed at a goal.
		Strike the iron when it's hot.	When I want to achieve something, I can wait for the right moment.
Compensation	Concerns maintenance of functioning by substitution of means in situation of losses of means.	Those without a horse walk.	When things don't work the way they used to, I look for other ways to achieve them.
		There are many hands; what one cannot do, the other will.	When things aren't going so well, I accept help from others.
		When there's no wind, grab the oars.	When things don't go as well as they used to, I keep trying other ways until I can achieve the same result I used to.

[a] Two facets of selection are distinguished in SOC theory: (1) elective selection and (2) loss-based selection, which encompasses restructuring of goal hierarchy, reducing the number of goals or various processes such as adjusting the level of aspiration, or developing new possible goals to match available resources.

the degree to which individuals report to use SOC-related behaviors. The resulting definitions of selection, optimization, and compensation may suggest that the relevant processes are often conscious and intentional. This is not necessarily so. Each of these elements or components can be active or passive, internal or external, conscious or unconscious.

Six additional characterizations help to place SOC into a larger perspective. First, we postulate that SOC is akin to a general-purpose mechanism of development. If available and well practiced, it will produce higher functioning in all domains of functioning. Second, we assume that SOC behaviors are universal processes generative of development. Third, we assume that SOC are inherently relativistic in that their phenotypic expressions depend on person- and context-specific features. Fourth, SOC in itself is a developmental construct. We assume that its peak expression is in adulthood. In childhood and adolescence, the system is acquired and honed, in old age, individuals work on maintenance (see Freund & Baltes, 2002b, for data on age trajectories). Fifth, we acknowledge that the functional utility of SOC is not given but remains a question of empirical validity. There are contexts where SOC may not be adaptive. Sixth, the function of the SOC components such as compensation in a given behavioral unit are not fixed. Their logical status can change, for instance, from active to passive. Similarly, a behavior that originally evolved in the context of a compensation for a loss may later be activated in a process where it serves as an optimizing means.

An everyday example may help to clarify the distinctions, drawn from the context of aging research that we used in our early efforts at developing the SOC model (P. B. Baltes, 1984). Into his late 70s and early 80s, the concert pianist Arthur Rubinstein continued to perform with great success. When asked how he managed to maintain such a high level of expert piano playing, he hinted in several interviews at the coordination of three strategies. First, he mentioned that he played fewer pieces (selection); second, he indicated that he now practiced these pieces more often (optimization); and third, he counteracted his loss in mechanical speed of playing by producing larger contrasts

in speed so to make the faster pieces appear faster (compensation).

Selection: Elective and Loss-Based. As noted already, *selection involves directionality, goals, and specification of outcomes.* There are two kinds of selection: elective selection and loss-based selection. Elective selection involves directionality that is self-initiated and considered desirable. Its motivational force is agent-driven. Loss-based selection is the consequence of a loss in functioning and typically involves making adjustments such as changes in level of aspiration or a change in goal structures or goal priorities.

Strictly speaking, selection already begins in embryonic development with features of the sensory system, such as differential sensitivity to light and pattern configurations. Neurophysiological processing of information represents another fundamental example of selection and selection-based specialization. Selective pruning of cells in early biological development is another example. Another concrete illustration of selection in development can be associated with a concept from developmental biology: Selection as the "canalized" (Waddington, 1975) realization of a set of outcomes from the "potentialities of ontogenesis" (plasticity). Another example of selection is the goal system (ranging from skills to attitudes and values) that defines the social and personal frames of desirable development. Selection can also involve the avoidance of specific outcomes of development such as the undesired self. In fact, life span development can be seen as involving a systematic age-related shift in the relative weight and frequency of approach versus avoidance goals (Freund & Ebner, 2005).

Optimization. The focus of optimization is on goal- or outcome-relevant means or resources. Thus, while selection is a necessary condition for achieving development (defined as the maximization of gains and minimization of losses), selection is not a sufficient condition for development to become manifest.

In addition, conditions and procedural mechanisms of goal-attainment are required, that is, methods or means of optimization. Optimization, then, involves processes aimed at the generation and refinement of means-ends resources and motivational-goal explication to achieve development-oriented positive outcomes (goals). For a psychologist, means include such processes as the learning of a skill or the acquisition of the motivational ability to persist or delay gratification. In general, the complexity of the system of optimization depends on the goal or outcome pursuit. If these are complex, optimization is not the refinement of a single means. Rather, in more complex situations, optimization requires a mutually enhancing coalition of factors, including health, environmental, and psychological conditions.

As was true for selection, optimization can be active and passive, conscious and subconscious, internal or external. Moreover, optimization can be domain- and goal-specific as well as domain- and goal-general. The most domain-general notion of optimization is the generation of what in our work we have called *developmental reserve capacity* (P. B. Baltes, 1987; Kliegl & Baltes, 1987), or what developmental life scientists might call *general plasticity* at the neuronal, behavioral, and social level. Because of its investability into many activities, generating a high level of general plasticity is the perhaps most significant target for successful development.

Compensation. The component process called *compensation involves a functional response to the loss of goal-relevant means* (see also Brandtstädter & Wentura, 1995; Dixon & Bäckman, 1995). This definition of compensation is more specific or restricted than the one proposed by Bäckman and Dixon (1992)—that is, it restricts compensation to responses to losses of means (resources) once available for goal attainment.

Two main causes give rise to a compensatory situation (Freund & Baltes, 2002b; Marsiske et al., 1995). Compensation can be the consequence of the very fact of selection and optimization. For reasons of limited capacity of time and effort, selection of and optimization toward a given goal implies the loss of time and means-related resources, relevant for the pursuit of other goals. Development is always a gain-loss dynamic. When an athlete aims for a high level performance in the shot put, it is unlikely that comparable high levels of performance can be achieved in other types of sports such as gymnastics. Another example is negative transfer. The acquisition of a targeted expert skill system A can result in negative transfer to another skill system B (Ericsson & Smith, 1991).

A second category of causes of compensation stems from negative changes in biological, social, and environmental resources in the conditions that represent the foundation of resources and their use for development (see also Hobfoll, 2001, on resource theory). Changing from one environment to another may involve a

loss in environment-based resources (means) or may make some acquired personal means dysfunctional. Losses due to the biology of aging are perhaps the best known age-associated negative changes in resources. With aging, there is a reduction in the rate and scope of plasticity (Cotman, 1985; Finch & Zelinski, 2005; S.-C. Li & Freund, 2005; Nelson, 2006; Reuter-Lorenz, 2002). As a result, the evolution of compensatory responses, in addition to loss-based selection, is a continuously changing dynamic of development in the second half of life.

Understanding this changing developmental dynamic is particularly important regarding the conceptual distinctiveness of optimization and compensation (Marsiske et al., 1995). At the point of origin, for instance, some behavior may have been compensatory (such as acquiring nonverbal techniques of communication due to a loss of foreign language proficiency), at later points in ontogeny or in different contexts these same compensation-based behavioral means (nonverbal techniques of communication) can be used as a technique of optimization, such as when improving one's performance as an actor. It is important, therefore, to specify the context and the developmental space in which a given behavioral event is considered when deciding about its category allocation to either selection, optimization, or compensation.

Because the model of SOC does not designate the specific content and form of desirable developmental outcomes, it is applicable to a large range of variations in goals and means of development. In this sense, then, SOC is at the same time *universal* and *relativistic.* Its universalism rests in the argument that any process of development is expected to involve components of selection, optimization, and compensation (P. B. Baltes & Baltes, 1990b; Marsiske et al., 1995). Its relativity lies in the variations of motivational, social, and intellectual resources, as well as in the criteria used to define successful development, which can be multivariate and involve both objective and subjective indicators (P. B. Baltes & Baltes, 1990a).

In the following two sections, which deal with life span developmental theory and research in two domains of functioning, we occasionally return to SOC-related interpretations. However, our intent is not to elevate that model or theory to the one overarching model of life span development. This would be inappropriate. In our view, the model of selective optimization with compensation is but one of the theoretical efforts that life span research and theory have spawned. However, we believe SOC to be a theory that displays much consistency across levels of analysis and can be usefully linked to other current theoretical streams in developmental psychology, such as to dynamic systems theory. Krampe and Baltes (2003) have illustrated in another area, the field of intelligence, how application of SOC theory leads to a different conceptualization of the structure and function of intelligence.

Empirical Evidence on SOC Theory

The articulation and testing of SOC theory is proceeding in a variety of domains. In general, the evidence has been supportive of the theoretical approach. People who report the use of SOC-related behaviors show higher levels of functioning. Moreover, on the behavioral level, research has shown that individuals manifest behaviors that are consistent with SOC theory. These outcomes carry a promissory note.

Age Gradients. Figure 11.7 summarizes evidence on cross-sectional age gradients. Young, middle-aged, and older adults answered a self-report instrument to assess preferred use of SOC strategies. As expected, the peak of using all SOC components was obtained for adults. In earlier and later phases of life, the SOC system seems less fully acquired, activated, or coordinated. In young adulthood, the task of life planning in a focused and concerted manner needs practice and refinement (e.g., J. Smith, 1999). Desires and volitions are less orchestrated. Similarly, in aging individuals, they need to master situations

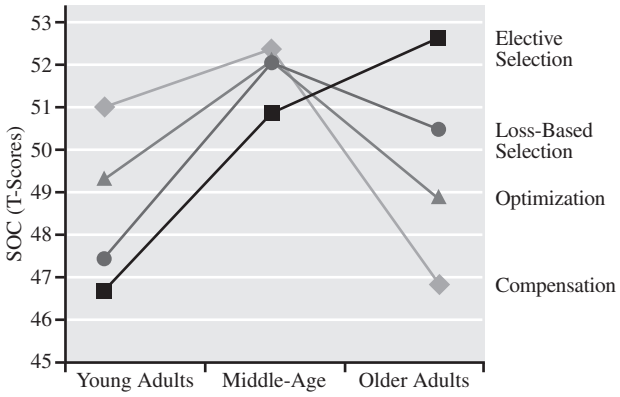


Figure 11.7 Age-group mean differences in four components of SOC (elective selection, loss-based selection, optimization, and compensation): Middle-aged adults report the highest and perhaps most integrated endorsement of SOC. *Source:* Modified from "Life-Management Strategies of Selection, Optimization, and Compensation: Measurement by Self-Report and Construct Validity" by A. M. Freund and P. B. Baltes, 2002b, *Journal of Personality and Social Psychology, 82,* pp. 642–662.

in which they have fewer resources. SOC behaviors themselves are effortful and require resources. Therefore, it is not surprising that older individuals show lesser frequency of use of optimization and compensation. As shown in Figure 11.7, the primary focus in older ages is on elective selection and loss-based selection.

Processes of selection, optimization, and compensation also are present in mental representations associated with the management of everyday lives. Freund and Baltes (2002a) have used proverbs to examine this question. They presented life problems to people and asked which proverb fits this situation best. Adults preferred proverbs that indicated SOC behaviors. Moreover, the choice reaction times of the oldest adults, when selecting the fitting proverb, was as fast as those of younger adults. Because reaction speed typically decreases with age during the age span studied, the finding suggests that SOC-based mental representations are well exercised.

Management and Mastery of Life Tasks. Another area of research is the management of the family career interface (B. B. Baltes & Heydens-Gahir, 2003; Wiese, Freund, & Baltes, 2002). Partners who reported higher use of SOC-related behaviors obtained higher scores on perceived developmental status in the two domains and higher levels of well-being; cross-sectionally and longitudinally. Similar findings were obtained with the task of college study behavior (Wiese & Schmitz, 2002). Regarding tasks of old age, work by Margret Baltes, Frieder Lang, and their colleagues is relevant (e.g., Lang, Rieckmann, & Baltes, 2002). They demonstrated that older individuals, especially when in situations of high difficulty, benefited from showing behaviors that were consistent with SOC theory. Another topic of life span research concerns the management of critical life events including illness. In this line of inquiry, Gignac, Cott, and Badley (2002) have shown that older people suffering from osteoarthritis managed their illness by use of behaviors that are consistent with selection, optimization, and compensation.

Dual-Task Research and Behavioral Indicators. An additional area where SOC theory turned out to be promising is dual-task research. Dual- or multiple-task research explores the degree to which individuals can perform several tasks concurrently and whether concurrent performance of several tasks (such as walking and memorizing) facilitates or interferes. Such multitask situations are prototypical of the ecology of everyday behavior. Moreover, with age children become better in handling multiple tasks simultaneously and minimize what is usually called dual-task costs. With aging, the reverse is true.

Dual-task research is a prime model to study development as a system of co-changing and collaborative processes, and of the process of differential allocation of resources. Several studies have tested SOC theory within this model or examined whether the findings are consistent with predictions from the theory. In a later section, we will describe these studies in more detail. Here, suffice it to briefly mention one series of studies.

In our laboratories, we focused on the joined performance of motor behavior (such as walking and keeping one's motor balance) and various processes of memory and solving cognitive tasks. Although older adults showed greater dual-tasks costs, they also exhibited clear preference in their task allocation. For instance, they invested a larger share of their resources into motor behavior (likely because falling is a high-risk in aging) and were more ready to de-invest from the cognitive task. Moreover, on the behavioral level, older adults were effective in using compensatory skills to maintain a higher level of performance (K. Z. H. Li, Lindenberger, Freund, & Baltes, 2001; Lindenberger, Marsiske, & Baltes, 2000).

These initial self-report and observational as well as experimental studies lend support to the perspective of the SOC theory of adaptive development. The pattern of findings suggests that individuals who select, optimize, and compensate are better able to *generate* new developmental resources and through effective *allocation* more effective available resources to manage the tasks of life. Thus, SOC functions like a development-enhancing and loss-preventing general-purpose mechanism. As a general theory of adaptive development, it characterizes a system of strategies that permits individuals to master the general tasks of life, including those that result from the overall life span script outlined earlier when we outlined a systematic change toward a greater proportion of dealing with losses rather than gains.

FIRST LEVEL 5 EXAMPLE: INTELLECTUAL FUNCTIONING ACROSS THE LIFE SPAN

In the following two sections, we focus on two broad areas of human development—intellectual functioning and personality—to present more specific life span research and theory. In general, our approach is to

present this work such that the general theoretical perspectives outlined provide an umbrella under which this research can be positioned and interpreted. Throughout, we attempt to highlight also the pervasiveness of the concept of developmental biocultural co-constructivism (P. B. Baltes et al., 2006).

The productivity of a life span orientation to developmental change depends critically on articulating the theoretical propositions regarding the macroscopic overall landscape of the entire course of ontogeny with more microscopic research on specific developmental functions, processes, and age periods. Specifically, the knowledge bases generated by researchers interested in different aspects of infancy, childhood, adolescence, adulthood, and late life need to be combined and compared with each other, and organized by the themes and propositions that guide the life span approach. The resulting life span integration of perspectives and findings, in turn, is hoped to feed back into the more age- and process-specific developmental specialties, providing for larger interpretative frameworks and provoking the investigation of new or formerly neglected research questions (Lindenberger, 2001).

The field of *intellectual development,* that captured early (Hollingworth, 1927; Sanford, 1902) and continuing attention in life span psychology (e.g., Craik & Bialystok, in press) is ideally suited to demonstrate the potential of this dynamic. Central themes of intellectual development such as relative stability (i.e., covariance change over time), directionality (i.e., mean change over time), plasticity (i.e., the malleability of mean and covariance changes), and the role of knowledge-based processes in cognitive development also have played a prominent role in life span theorizing, and are well suited to exemplify the dynamics between specialized research contexts and overarching conceptions of life span development.

The Biology and Culture of Life Span Intellectual Development

Our proposed view of the overall landscape of ontogenesis as summarized in Figure 11.1 puts constraints on the possible form and content of theories about life span intellectual development. Foremost, any model or theory on life span intellectual development needs to recognize that ontogenesis is a co-construction of two intertwined streams of inheritance, the biological and the cultural (Durham, 1991; see also P. B. Baltes et al., 2006; S.-C. Li, 2003), and needs to provide a framework for the developmental investigation of these two streams of inheritance in different domains, and at different levels of analysis. Specifically, the model should be consistent with the three-fold characterization of the life span dynamics between biology and culture summarized in Figure 11.1, and with the family of theoretical propositions summarized in Table 11.3.

The Two-Component Model of Life Span Cognition: Mechanics versus Pragmatics

In the past, initiated by one of us (P. B. Baltes, 1987, 1993, 1997) but soon co-developed with others (e.g., P. B. Baltes et al., 1984; P. B. Baltes, Staudinger, & Lindenberger, 1999; S.-C. Li, 2002; Lindenberger, 2001), have proposed a theoretical framework for the study of intellectual development in which two main categories or components of intellectual functioning are set apart: The mechanics and the pragmatics of cognition. Juxtaposing the two does not imply that they are independent or exclusive; rather, they interact across ontogenetic and microgenetic time in the production of intelligent behavior. As a general principle, the cognitive mechanics, because of their evolutionary base, evolve earlier in human ontogeny, and are being "invested" into the acquisition of higher and knowledge-based cognitive functions (for similar assumptions in the context of Gf/Gc theory, see Cattell, 1971).

Historically, our views on the overall landscape of human development were developed in close connection with the broadening and systematization of the mechanic-pragmatic distinction (P. B. Baltes, 1987, 1997; P. B. Baltes, Lindenberger, & Staudinger, 1998; S.-C. Li, 2003). Specifically, we construe the mechanics of cognition as an expression of the neurophysiological architecture of the mind as they evolved during biological evolution (cf. Gigerenzer & Todd, 1999) and unfold during ontogeny (McClelland, 1996; W. Singer, 1995). In contrast, the pragmatics of cognition are associated with the bodies of knowledge available from and mediated through culture (see upper portion of Figure 11.8).

The Cognitive Mechanics. The mechanics of cognition are closely linked to biological including neurophysiological brain conditions, and the predominant age-graded ontogenetic pattern is one of maturation, stability, and aging-induced decline. Especially early and late in ontogeny, age-based changes in this component are assumed to primarily reflect factors closely related to biological brain status, albeit in fundamentally different ways (P. B. Baltes, 1997; S.-C. Li, Lindenberger, et al., 2004; Lindenberger, 2001). Early in ontogeny (i.e., during embryogenesis, infancy, and early

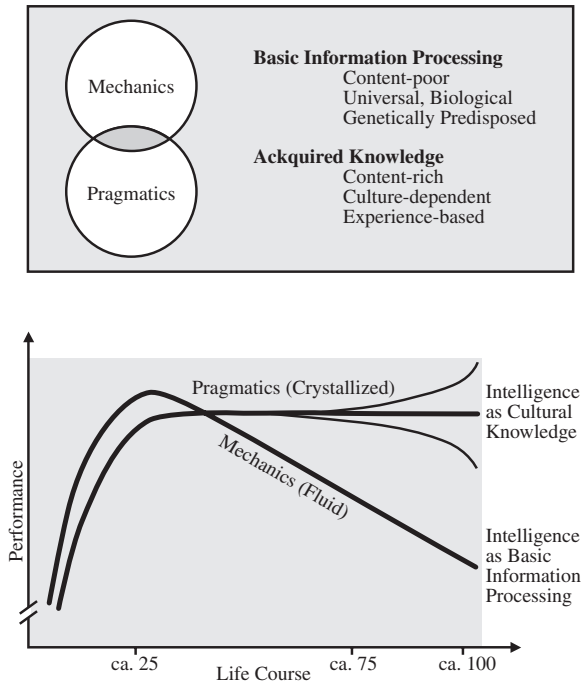


Figure 11.8 Life span research on two components of cognition: (1) fluid mechanics and (2) crystallized pragmatics. The top section defines the categories; the bottom section illustrates postulated lifespan trajectories. *Source:* Modified based on "Psychological Aspects of Aging: Facts and Frontiers" (pp. 427–459), by P. B. Baltes and P. Graf, in *The Life-Span Development of Individuals: Behavioural, Neurobiological and Psychosocial Perspectives,* D. Magnusson (Ed.), 1996, Cambridge, England: Cambridge University Press; From "Major Abilities and Development in the Adult Period" (pp. 44–99), by J. L. Horn and S. M. Hofer, in *Intellectual Development,* R. J. Sternberg & C. A. Berg (Eds.), 1992, New York: Cambridge University Press.

childhood), age-based changes in the mechanics are assumed to consist, for the most part, in the unfolding and active construction of more or less domain-specific and genetically predisposed processing capabilities (Elman et al., 1996; Wellman, 2003). In contrast, negative changes in the mechanics of cognition late in life presumably result from brain-related consequences of less effective phylogenetic selection pressures operating during this period (Kirkwood, 2003; Thaler, 2002; see "The Mechanics and Pragmatics in Very Old Age"). In that sense, the life span trajectory of level changes in the mechanics of cognition can be derived from the life span changes shown in the left panel of Figure 11.1.

The cognitive mechanics, then, reflect fundamental organizational properties of the central nervous system (W. Singer, 1995). In terms of psychological operations, we assume that the cognitive mechanics are indexed by the speed, accuracy, and coordination of elementary processing operations as they can be assessed in tasks measuring the quality of information input, sensory and motor memory, discrimination, categorization, and selective attention, as well as reasoning ability in highly overlearned or novel domains (Craik, 1986; Craik & Bialystok, in press; Craik & Salthouse, 2000; Hommel, Li, & Li, 2004; Salthouse & Kail, 1983). At the neuronal level, age-graded anatomical, chemical, and functional changes in the brain and their complex relations to the cognitive mechanics are being uncovered with increasing precision and scope (P. B. Baltes et al., in press; Cabeza, Nyberg, & Park, 2004; Craik & Bialystok, in press; Lindenberger, Li, & Bäckman, in press).

The Cognitive Pragmatics. In contrast to the mechanics, the cognitive pragmatics of the mind reveal the power of human agency and culture (Boesch, 1997; Cole, 1996; Valsiner & Lawrence, 1997; S.-C. Li, 2003; Shweder, 1991). The cognitive pragmatics also are at the center of socialization events that follow the principles of co-construction (P. B. Baltes et al., in press; S.-C. Li, 2003). Some of these events are normative but specific to certain cultures (e.g., formal schooling), others are more universal (e.g., mentoring), and still others are idiosyncratic or person-specific (e.g., specialized ecological and professional knowledge). In any case, the corresponding bodies of knowledge are represented both internally (e.g., semantic networks) and externally (e.g., books).

The pragmatics of cognition direct the attention of life span developmentalists toward the increasing importance of knowledge-based forms of intelligence during ontogeny (P. B. Baltes & Baltes, 1990a; Ericsson & Smith, 1991; Hambrick & Engle, 2002; Krampe & Baltes, 2003; Labouvie-Vief, 1982; Rybash, Hoyer, & Roodin, 1986). Typical examples include reading and writing skills, educational qualifications, professional skills, and varieties of everyday problem-solving, but also knowledge about the self and the meaning and conduct of life (P. B. Baltes & Staudinger, 2000; Blanchard-Fields, 1996; Bosman & Charness, 1996; Marsiske et al., 1995; Staudinger et al., 1995; see "Face and Facets of the Study of Personality Development across the Life Span"). Such bodies of pragmatic knowledge are acquired during ontogeny but may build on evolutionarily prestructured, domain-specific knowledge (Charness, 2005; Elman et al., 1996; Tomasello, 1999).

Divergence in Life Span Trajectories between Mechanics and Pragmatics. The preceding considerations imply specific predictions regarding the shape of

ontogenetic trajectories for mechanic and pragmatic aspects of intellectual functioning (see lower portion of Figure 11.8). Specifically, two different sources of influence are assumed to govern the level of performance within these two categories: biological-genetic for the mechanics, and environmental-cultural for the pragmatics. The expected divergence in age trajectories is seen as a consequence of this difference in composition.

Empirical evidence in support of a two-component conceptualization of life span cognition comes from a great variety of different research traditions (see discussion that follows). Probably the most longstanding supportive evidence is the difference between maintained and vulnerable intellectual abilities (Salthouse, 1991; cf. Jones & Conrad, 1933). Abilities that critically involve the mechanics, such as reasoning, memory, spatial orientation, and perceptual speed, generally show a pattern of monotonic and roughly linear decline during adulthood, with some further acceleration of decline in very old age. In contrast, more pragmatic abilities, such as verbal knowledge and certain facets of numerical ability, remain stable or increase up to the 6th or 7th decade of life, and only start to evince some decline in very old age.

Figure 11.9, based on the fifth data collection of the Seattle Longitudinal Study (Schaie, 1996; see also Schaie et al., 2005), may serve as an illustration. It displays cross-sectional adult age gradients based on multiple indicators for six intellectual abilities (Schaie & Willis, 1993). Verbal ability and number ability peak during middle adulthood and show little or no age decrements before the age of 74, whereas perceptual speed, inductive reasoning, spatial orientation, and verbal memory show steady monotonic decline. Recent analyses based on longitudinal as well as longitudinal/cross-sectional convergence data provide additional and more direct support for a basic divergence between mechanic and pragmatic age gradients in adulthood and old age (Salthouse, 1991; Schaie, 1996; Schaie, Maitland, Willis, & Intieri, 1998; T. Singer, Verhaeghen, Ghisletta, Lindenberger, & Baltes, 2003).

In a recent cross-sectional study, Shu-Chen Li and colleagues (2004) investigated whether dissociations in age trajectories between mechanic and pragmatic intellectual abilities across can be observed across the entire life span, as life span psychology would predict. The authors administered a psychometric battery comprising fifteen tests assessing three marker abilities of the fluid mechanics (perceptual speed, reasoning, and fluency) and two

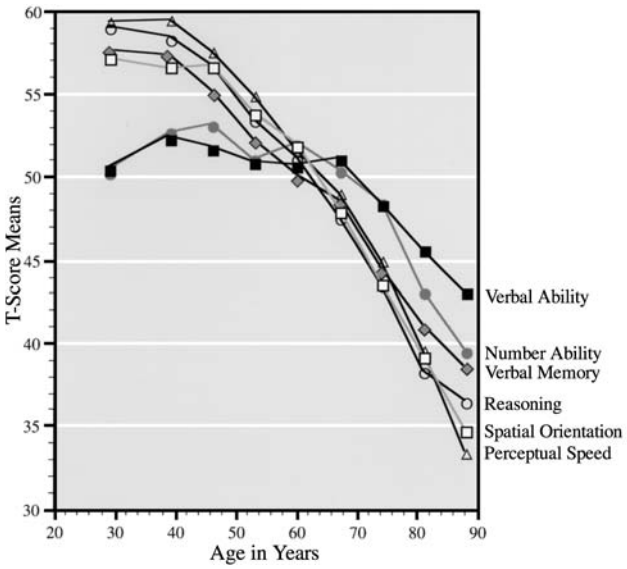


Figure 11.9 Cross-sectional age gradients in six primary mental abilities ($N = 1628$). Abilities were assessed with 3 to 4 different tests and are scaled in a T-score metric (i.e., *mean* = 50, $SD = 10$). Verbal ability and number ability peak during middle adulthood and show little or no age decrements before the age of 74. In contrast, perceptual speed, inductive reasoning, spatial orientation, and verbal memory show steady monotonic decline. This differential pattern of prevailing growth, maintenance, and subsequent loss supports two-component theories of life span intellectual development such as the distinction between fluid and crystallized intelligence made by Cattell (1971) and J. L. Horn (1982) or the juxtaposition of the mechanics and the pragmatics of cognition proposed by P. B. Baltes (1987, 1993). *Source:* From "Age Difference Patterns of Psychometric Intelligence in Adulthood: Generalizability within and across Ability Domains," by K. W. Schaie and S. L. Willis, 1993, *Psychology and Aging, 8,* pp. 44–55.

marker abilities of the crystallized pragmatics (verbal knowledge and fluency) to individuals aged 6 to 89 years. Participants were classified into six age groups, childhood (6 to 11 years), adolescence (12 to 17 years), early adulthood (18 to 35 years), middle adulthood (26 to 54 years), late adulthood (55 to 69 years), and old age (70 to 89 years). In addition, S.-C. Li et al. (2004) also administered basic reaction time tasks to index processing speed (i.e., a person's average speed of responding across the five tasks) and processing robustness (i.e., the inverse of a person's average within-task reaction-time fluctuation). As expected, the life span trajectories of the two information processing and the fluid-mechanic composite stood in contrast to the trajectory of the crystallized-mechanic composite (see Figure 11.10). Moreover, within the mechanic domain, the trajectories for the two

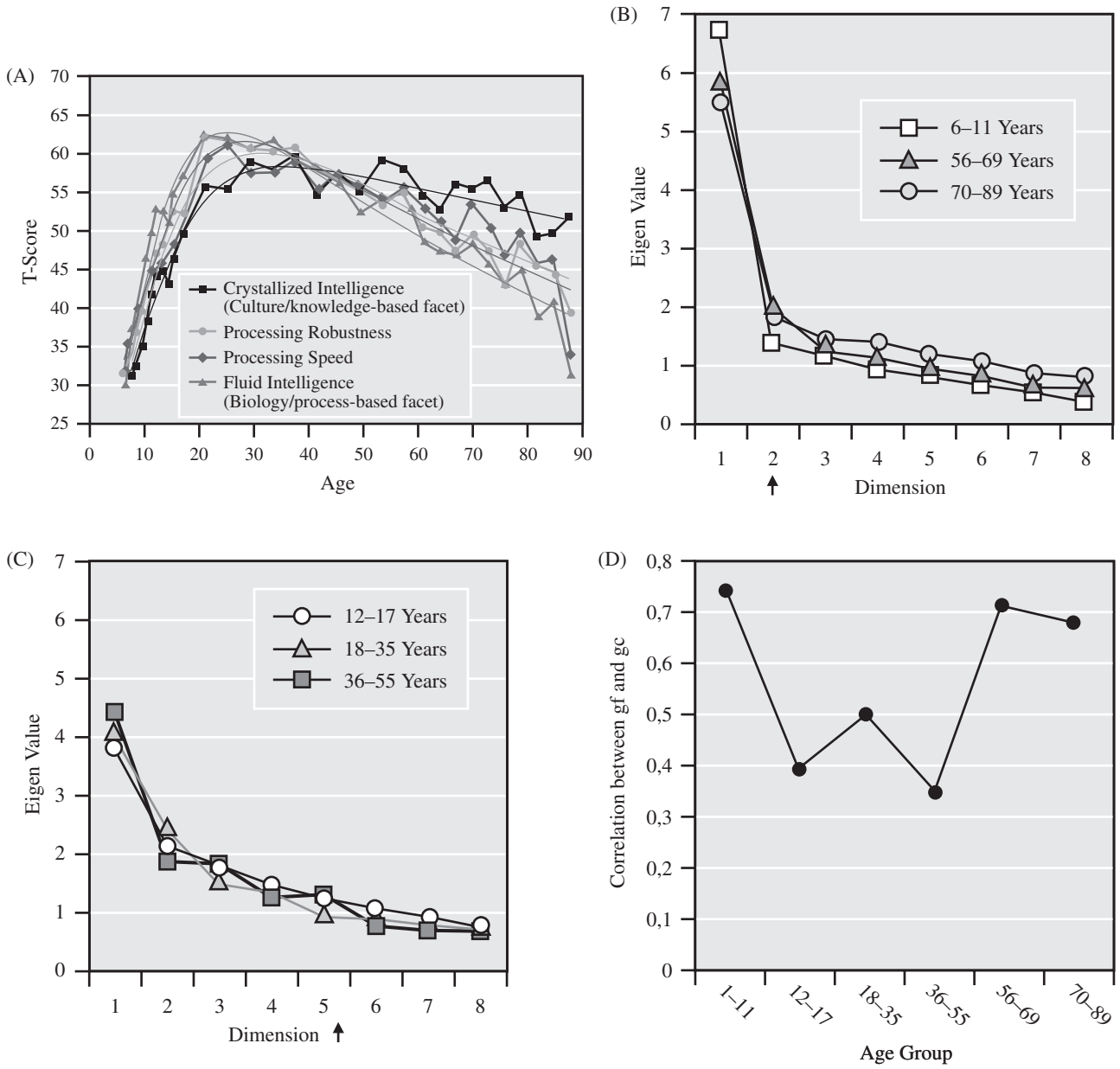


Figure 11.10 Intellectual abilities across the life span. (A) Cross-sectional age trajectories for crystallized intelligence, processing robustness, processing speed, and fluid intelligence. Crystallized intelligence represents the cognitive pragmatics, whereas processing robustness, processing speed, and fluid intelligence represent the cognitive mechanics. The divergence in age gradients between pragmatics and mechanics lends support to two-component theories of cognitive development. (B, C) Results from principal component analyses of 15 intellectual ability tests for each of six age groups. The arrows indicate the estimated number of principal components with eigenvalues greater than unity. (D) Correlations between broad fluid and crystallized intelligence for the same six age groups. Panels B-D support the hypothesis that the structure of intellectual abilities is less differentiated in childhood and old age than during adolescence and adulthood. *Source:* From "Transformations in the Couplings among Intellectual Abilities and Constituent Cognitive Processes across the Life Span" by S.-C. Li, U. Lindenberger, B. Hommel, G. Aschersleben, W. Prinz, and P. B. Baltes, 2004, *Psychological Science, 15,* pp. 155–163.

information-processing composites showed an earlier cross-sectional life span peak than the trajectory for the fluid-mechanic component, supporting the contention that the admixture of pragmatic variance contaminates standard assessments of broad fluid intelligence.

The Two-Component Model: Relations to Other Multiple-Component Theories

Arguably, Tetens (1777) provided the earliest comprehensive formulation of a two-component model of life span cognition (Lindenberger & Baltes, 1999); his definition of absolute and relative capacities closely approximated the definition of the mechanics and pragmatics of cognition, respectively. The closest relative, both conceptually and historically, to the two-component model of life span intellectual development is the theory of fluid (Gf) and crystallized (Gc) abilities by Cattell (1971) and Horn (1982; for comparative discussion, see P. B. Baltes et al., 1998; Lindenberger, 2001). Other approaches related to the two-component model include Ackerman's (e.g., 1996) process, personality, interests, and knowledge (PPIK) model, Hebb's (1949) distinction between intelligence A (i.e., intellectual power) and intelligence B (i.e., intellectual products), the encapsulation model of adult intelligence proposed by Rybash et al. (1986; Hoyer, 1987), and Sternberg's (1985) triarchic theory of intelligence, especially its developmental interpretation by Berg and Sternberg (1985a).

Here, the two-component model will be further elaborated in three separate sections: Mechanics, pragmatics, and their interrelations. The aim of these three sections is not to be comprehensive, but to further specify the two components of cognition as well as their interaction.

The Fluid Mechanics of Cognition

We start this section with a life span summary of research on constructs that have been proposed to cause or mediate age-based changes in the mechanics of cognition. We then argue that much of the available evidence about age-based changes in the mechanics derives from measures that are contaminated by pragmatic influence, and we underscore the need to arrive at more valid estimates of individual differences in upper limits of mechanic functioning. In line with the two-component model, we predict that age differences in the mechanics are magnified under purified measurement conditions and provide an empirical example from adulthood in support of this prediction.

The Search for Determinants of Mechanic Development

Despite a large overlap in approaches to the study of intellectual development, there are surprisingly few attempts to pursue the themes of infant and child development into adulthood and old age, or to identify thematic and predictive antecedents of adulthood and old age in childhood (see S.-C. Li, Lindenberger, et al., 2004). An important exception in this regard concerns work on age changes in general information-processing constraints on intellectual functioning across the life span, or what we would call research on the determinants of age-based changes in the mechanics of cognition. Researchers both in the fields of child development (Bjorklund, 1997; Case, 1992; McCall, 1994; Pascual-Leone, 1983) and cognitive aging (Birren, 1964; Cerella, 1990; Craik & Byrd, 1982; Hasher & Zacks, 1988; S.-C. Li, Lindenberger, & Sikström, 2001; Salthouse, 1996) have been trying to identify developmental determinants or "developables" (Flavell, 1992) that regulate the rate of age-based changes in cognitive and intellectual functioning. Some scholars have begun to link these two lines of inquiry by attempting to provide unified accounts of age-based changes in the structure and/or efficiency of information processing (e.g., Craik & Bialystok, 2006; Hommel, Li, & Li, 2004; S.-C. Li, Lindenberger, et al., 2004; Salthouse & Kail, 1983; Wellman, 2003).

In many cases, the central goal of these endeavors is to identify the number (dimensionality), nature, and causal dynamics of age-graded changes in the mechanics of cognition. Though this task seems conceptually straightforward, it is methodologically quite intricate (P. B. Baltes & Labouvie, 1973; Hertzog, 1985; Hertzog & Nesselroade, 2003; Lindenberger & Pötter, 1998; Reinert, Baltes, & Schmidt, 1966). Chronological age carries a multitude of causal agents with different and intertwined temporal dynamics and timescales such as distance from birth, distance from death, distance from disease inception, but also number of hours of practice or formal training. For instance, when two variables assumed to index two causal agents follow a similar path over ontogenetic time, this does not imply that the two causes are functionally related. Therefore, evidence about determinants of mechanic development needs to be evaluated with caution, especially if based on age-heterogeneous cross-sectional data sets (Lindenberger & Pötter, 1998).

In the following section, we selectively review research on possible determinants of life span changes in

the mechanics of cognition. We start with three constructs located at the information-processing level of analysis, and end with a consideration of select age-graded changes at the neuronal level. Progress in understanding determinants of life span changes in the mechanics of cognition field will depend on integrating these two levels of analysis both empirically and conceptually (Buckner, 2004; Craik & Bialystok, in press; S.-C. Li, in press; S.-C. Li & Lindenberger, 1999; Lindenberger, Li, & Bäckman, in press).

At the information-processing level, processing rate (Cerella, 1990; Salthouse, 1996), working memory (Baddeley, 2000; Just, Carpenter, & Keller, 1996), and inhibition (Hasher & Zacks, 1988) have been studied most extensively. Apparently, functional levels of these three mechanisms follow the inverse U-shape pattern predicted by the two-component model for the mechanics of cognition. In principle, then, any combination of these mechanisms could act as a pacemaker of life span development in the mechanics of cognition.

Processing Speed. Across a wide variety of cognitive and perceptual tasks, speed of responding increases dramatically from childhood to early adulthood, and continuously decreases thereafter. This observation has led to the processing rate hypothesis of life span cognitive development. Probably, this hypothesis holds a more central place in cognitive aging research (e.g., Birren, 1964; Cerella, 1990; Salthouse, 1996; Welford, 1984) than in research on child development (e.g., Hale, 1990; Kail, 1996). In the case of cognitive aging, the general slowing-down of cognitive behavior with advancing age is portrayed as the consequence of a general decrement in information processing rate. In cross-sectional studies, psychometrically assessed perceptual speed accounts for most or all negative adult age differences in other intellectual abilities, even if these other abilities are assessed under time-relaxed or untimed testing conditions (for a summary, see Verhaeghen & Salthouse, 1997). However, psychometrically assessed perceptual speed is not a unitary construct or processing primitive but a factorially complex entity whose composition may change as a function of age. Also, attempts at identifying neuronal correlates of age-based differences in processing speed have yielded mixed results (e.g., Bashore, Ridderinkhof, & van der Molen, 1997).

Working Memory. Generally, working memory denotes the ability to preserve information in one or more short-term stores while simultaneously transforming the same or some other information (Baddeley, 2000; Just et al., 1996). Age differences in working memory have been invoked as a possible cause for intellectual growth during childhood (Case, 1985; Chapman & Lindenberger, 1992; Halford, 1993; Pascual-Leone, 1970), and for age-based decrements during adulthood and old age (Craik, 1983; Oberauer & Kliegl, 2001). With respect to childhood, Neo-Piagetian theorists have argued that changes in working memory are among the primary pacemakers of intellectual child development (e.g., Pascual-Leone, 1970).

Positive age differences during childhood and negative age differences during adulthood are more pronounced when demands on processing are increased (Mayr, Kliegl, & Krampe, 1996). Despite this supportive evidence, the explanatory power of the working-memory construct is difficult to judge. For instance, age-based changes in working memory are often explained by alluding to changes in processing efficiency or processing speed (Case, 1985; Salthouse, 1996). Another problem concerns our limited knowledge about a central function of working memory—the (conscious) control of action and thought. In the most influential working-memory model (Baddeley, 2000), this task is assigned to the central executive. Evidence from developmental psychology (Houdé, 1995; McCall, 1994), cognitive-experimental and differential psychology (Engle, Kane, & Tuholski, 1999), and the cognitive neurosciences (Miller & Cohen, 2001) suggests that the abilities to inhibit actions and thoughts and avoid interference from competing processing streams are crucial for the efficient functioning of this component, rather than working-memory capacity per se.

Inhibition and Interference. During the past decades, developmentalists from different traditions and fields of research have intensified their interest in mechanisms of inhibition and interference (Bjorklund, 1997; Engle, Conway, Tuholski, & Shishler, 1995; Hasher & Zacks, 1988; Houdé, 1995; McCall, 1994). Curvilinear life span age gradients that resemble those found for measures of perceptual speed have been obtained with typical tests of interference proneness such as the Stroop color-word test, suggesting that children and especially older adults have greater difficulties in suppressing currently irrelevant action tendencies than young adults (Dempster, 1992; Hommel et al., 2004; Mayr, 2001). However, it has proven difficult to separate

inhibition-based explanations of this phenomenon from activation-based explanations of selective attention and working memory capacity (Engle et al., 1995; Hommel et al., 2004).

Cognitive Neuroscience Approaches to Mechanic Development: The Sample Case of Prefrontal Circuitry. The advent of brain imaging methods has allowed researchers to intensify empirical links between behavioral and neuronal levels of analysis. The conceptual and empirical implications of this trend for developmental psychology are discussed more fully elsewhere (e.g., P. B. Baltes et al., in press; Cabeza et al., 2004; Craik & Bialystok, in press; S.-C. Li, 2002; Lindenberger et al., in press). In the following discussion, we restrict our presentation to maturational and senescent changes in prefrontal circuitry. Available evidence suggests that these changes may contribute in important ways to changes in the cognitive mechanics during childhood and old age.

We begin with some evidence on regional brain development. In early ontogeny, prefrontal cortex and associated neural networks undergo profound anatomical, chemical, and functional changes that extend well into adolescence. Neural plasticity during corticogenesis entails the production and experience-dependent elimination of neuronal connections (Huttenlocher & Dabholkar, 1997). During brain development, the zone of maximum plasticity moves from primary sensory and motor over secondary association to prefrontal areas (Chugani, Phelps, & Mazziotta, 1987). Computational models suggest that later maturing areas require input from earlier maturing areas to represent higher-order concepts (Shrager & Johnson, 1996). Arguably, the gradual and orderly progression of the corticotrophic wave provides a chronotopic constraint for cerebral cortex organization.

In later adulthood, prefrontal cortex and the functionally connected basal ganglia also show greater and earlier signs of decline than most other areas of the brain. In a comprehensive review of the neuroanatomical literature, Raz (2000) reported average linear reductions in brain weight and volume of about 2% per decade during adulthood, which were more pronounced for anterior parts of the brain (for longitudinal evidence, see Raz, Lindenberger, et al., 2005). At the neurochemical level, changes in the catecholaminergic system, most notably dopamine, play a prominent role (Bäckman & Farde, 2004). Finally, neurofunctional studies point to profound age-associated changes in the functional organization of prefrontal cortex such as a reduction in the asymmetry of hemispheric activation (e.g., Cabeza, 2002).

The links between behavioral development and regional brain differentiation are only beginning to emerge (e.g., Lindenberger et al., in press), and the precise relations between life span changes in prefrontal circuitry and behavioral changes remain to be uncovered. Functions similar to working memory and typically subsumed under the heading of "executive functions" or "cognitive control" appear to be involved (Engle et al., 1999; Kliegl, Krampe, & Mayr, 2003). Situations deemed to be particularly dependent on prefrontal circuitry require the coordination of multiple tasks or task components. Typical examples include the suppression of stimulus-driven action tendencies (Metcalfe & Mischel, 1999; Salthouse & Meinz, 1995), multitasking (Mayr et al., 1996; Salthouse, Hambrick, Lukas, & Dell, 1996) and response selection under high stimulus ambiguity (Kramer, Hahn, & Gopher, 1999; Kray & Lindenberger, 2000). Differential susceptibility to coordinative demands may help to explain why life span age differences in marker tests of fluid intelligence such as Raven's matrices tend to persist when participants are given unlimited amounts of time to solve the items (cf. the simultaneity mechanism in Salthouse, 1996).

Future research needs to explicate the link between life span changes in prefrontal circuitry and the mechanics of cognition with greater precision. Given the fundamentally different etiology of changes in prefrontal circuitry early and late in ontogeny, and given that late-life changes are taking place in a cognitive system with a rich and idiosyncratic learning history, any expectation of a close resemblance between brain-behavior mappings early and late in life seems unwarranted.

Age-Based Differences in the Mechanics of Cognition: The Need for Purification of Measurement

Observed age differences or age changes on intellectual tasks and tests, as obtained in standard cross-sectional and real-time longitudinal research, cannot be regarded as direct and pure reflections of age-based changes in the mechanics of cognition. Rather, in addition to the mechanics, such differences or changes are influenced by a wealth of additional factors, ranging from pragmatic components of cognition (e.g., task-relevant preexperimental knowledge) to other person characteristics (e.g., test anxiety or achievement motivation; cf. Fisk & Warr, 1996). A

likely indication for this admixture of pragmatic variance to supposedly mechanic measures is the secular rise in performance on typical psychometric marker tests of fluid intelligence (cf. Flynn, 1987; Schaie et al., 2005). In our view, it seems an open question whether the preferred interpretation by Flynn that these historical changes reflect changes in fluid intelligence per se is correct. Unless more pure measures of basic fluid intelligence were included, we hold it more likely that these historical changes are changes in the pragmatics rather than the mechanics (see also Schaie et al., 2005).

The need for better estimates of individuals' performance potential in the mechanics of cognition is further nurtured by the life span proposition that epigenesis is probabilistic but not random; hence, plasticity is more or less constrained (P. B. Baltes, 1987; Gottlieb, 1998; Hagen & Hammerstein, 2005; R. M. Lerner, 1984; see Table 11.3). If the goal is to separate the possible from the impossible over age, and to solidify the evidence on age differences in the mechanics of cognition, the context of measurement needs to be moved toward upper limits of performance potential. This line of reasoning resembles claims made by other research traditions, such as clinical and developmental diagnostics (Carlson, 1994; Guthke & Wiedl, 1996), the differentiation between performance and competence, gestalt and cultural-historical theoretical orientations (Vygotsky, 1962; H. Werner, 1948), and early work on life span differences in learning (B. Levinson & Reese, 1967). Discrepancies in epistemology and purpose notwithstanding, all these traditions are inspired by an interest in exploring individuals' upper limits of intellectual performance.

Testing the Limits of Age Differences in the Mechanics of Cognition. Within life span developmental psychology and as alluded to earlier, the testing-the-limits paradigm has been introduced as a research strategy to uncover age differences in the upper limits of mechanic functioning across the life span (P. B. Baltes, 1987; Kliegl & Baltes, 1987; Lindenberger & Baltes, 1995b). The main focus of this paradigm is to arrange for experimental conditions that produce maximum (i.e., asymptotic) levels of performance. Thus, similar to stress tests in biology and medicine (M. M. Baltes, Kühl, Gutzmann, & Sowarka, 1995; Fries & Crapo, 1981), testing-the-limits aims at the assessment of age differences in maximum levels of cognitive performance by providing large amounts of practice and/or training combined with systematic variations in task difficulty. Furthermore, and in line with the microgenetic approach to the study of change (Siegler & Crowley, 1991; Siegler, Chapter 11, this *Handbook,* this volume), the testing-the-limits paradigm is based on the assumption that the study of microgenetic change and variability may help to identify mechanisms underlying ontogenetic change (see H. Werner, 1948). Thus, in addition to the more general goal of measurement purification, the detailed analysis of time-compressed developmental change functions is assumed to enhance our understanding of the mechanisms and the range of medium- and long-term developmental changes (Hultsch & MacDonald, 2004; S.-C. Li, Huxhold, et al., 2004; Lindenberger & von Oertzen, in press).

A Prototypical Example: Adult Age Differences in Upper Limits of Short-Term Memory (Serial Word Recall)

Figure 11.11 shows the result of a study involving a total of 38 sessions of training and practice in the Method of Loci, a mnemonic technique for the serial recall of word lists. Two findings from this study are noteworthy. First, adults in both age groups greatly improved their memory performance. This finding confirms earlier work on the continued existence of cognitive plasticity in cognitively healthy (i.e., nondemented) older adults (P. B.

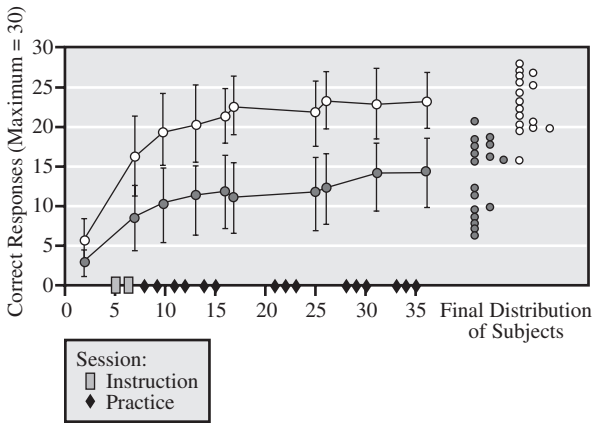


Figure 11.11 Testing-the-limits research, which is aimed at the identification of asymptotes of performance potential, suggests the existence of robust age-related losses in the mechanics of cognition. The example given involves a memory technique, the Method of Loci. After 38 sessions of training, most older adults did not reach the level of performance reached by younger adults after only a few sessions. In the final distribution, no older person was performing above the mean of the young adults. Adapted from P. B. Baltes & Kliegl, 1992.

Baltes & Lindenberger, 1988; P. B. Baltes & Willis, 1982; Verhaeghen, Marcoen, & Goossens, 1992). Second, practice and training resulted in a close-to-perfect separation of the two adult age groups, thereby demonstrating the existence of sizeable negative age differences at limits of functioning. Even after 38 sessions of training, the majority of older adults did not reach the level of performance that young adults had reached after only a few sessions. Moreover, at the end of the study, not a single older person functioned above the mean of the young-adult group. A more recent investigation has shown that upper limits of performance are further reduced in very old age (T. Singer, Lindenberger, & Baltes, 2003).

The findings obtained with the testing-the-limits paradigm are consistent with our general notion that the mechanics of cognition decrease during adulthood and old age. Given our assumptions regarding life span changes in adaptive capacity of the mechanics of the mind and the knowledge-contaminated nature of standard assessments, we predict that life span peaks in performance levels are shifted toward younger ages when individuals are given the opportunity to come close to their upper limits of mechanic potential. Results from a recent experimental study have confirmed these expectations (Brehmer, Li, Müller, Oertzen, & Lindenberger, 2005).

In addition to encompassing wide age ranges, future explorations of life span differences in behavioral plasticity may also include functional and anatomical neural measures to identify life span differences in the relation between behavioral and neuronal plasticity (for exemplary work, see Kramer et al., in press; Nyberg et al., 2003). Also, the focus on age differences in maximum level should be complemented by an emphasis on age-differential changes in variances and covariances with practice (Hertzog, Cooper, & Fisk, 1996; Labouvie, Frohring, Baltes, & Goulet, 1973). Specifically, to better understand neuronal correlates of age differences in the acquisition of expertise, it seems productive to study life span differences in the brain's adaptation in response to intensive training programs.

At present the major conclusion regarding the plasticity of the mechanics across the lifespan is that plasticity may be substantial in childhood, that it decreases markedly with age, and that it's demonstrated plasticity after middle adulthood is modest at best. This conclusion holds especially, if one defines a high threshold for assessing whether a given training program resulted in a true improvement of the mechanics themselves (Baltes & Lindenberger, 1988). For instance, it is not easy to argue against alternative interpretations, such as that the improvement in the cognitive system is due to adding pragmatic rather than mechanical components to the solution process. We would need more purist measures of the cognitive mechanics than are currently available. Moreover, issues of transfer and maintenance are at stake. If the results were an improvement in the mechanics themselves, the evidence should include the demonstration of improvement in learning gains across a wide range of new tasks, or at least within the "modularity" class within which the training tasks are putatively located. The absence of such evidence my be due to the fact that many training programs are behavioral in origin. It will be interesting to see whether biochemical interventions, such as memory pharmaceuticals to improve the transmission from primary to secondary memory might be more powerful in improving the cognitive mechanics in a more direct manner. Here, the newly evolving cooperation between biochemically oriented neuroscientists and behaviorally-oriented learning psychologists may offer a new window on the plasticity of the cognitive mechanics during adulthood as well (see also Goldberg & Weinberger, 2004; Kempermann, 2006).

The Crystallized Pragmatics of Cognition

We now direct our attention to the ontogeny of the cognitive pragmatics, or the cultural and knowledge-rich dimension of intellectual life span development. First, we discuss the relation between mechanics and pragmatics from an evolutionary perspective. Then, we introduce the distinction between normative and person-specific forms of pragmatic knowledge, and discuss stage- and knowledge-oriented approaches. We end this section with examples from our own research on expert knowledge about the fundamental pragmatics of life (wisdom).

Mechanics and Pragmatics in Evolutionary Perspective

In recent decades, nativist approaches to infant cognitive development have revealed the evolutionary informed nature of the human processing system (e.g., Spelke, Vishton, & von Hofsten, 1995). Through innovative advances in experimental methodology, it has become increasingly clear that infants and young children cannot be considered a cognitive tabula rasa, as extreme

interpretations of constructivist (e.g., Piaget, 1967/1971, but see Piaget, 1980, pp. 11–12) or behaviorist (e.g., B. F. Skinner, 1966) theorizing may suggest. Rather, not unlike members of other species, humans begin their extra-uterine lives with a well-orchestrated set of domain-specific constraints and expectations that guide behavior and form the basis for later acquisitions (Elman et al., 1996; Saffran, Aslin, & Newport, 1996).

We assume that the pragmatics of cognition, or the bodies of knowledge provided by culture build on, extend, and reorganize these prestructured core domains, both during evolution and during ontogeny (Gigerenzer, 2003; Wellman, 2003). These processes of extension and transformation eventually give rise to forms of knowledge and behavior that are, in part by virtue of necessity, *compatible* with the biological architecture of the mind, but cannot be characterized as the *direct consequence* of evolutionary selection pressures.

The resulting potential of human ontogeny to create and adapt to the new (Gottlieb, 1998), or the productive tension between current functions and evolutionary history, has been referred to as exaptative generalization or *exaptation* (Gould & Vrba, 1982). As a mechanism of biocultural co-construction, exaptation helps to explain why members of the human species are good at doing things that were certainly not directly at the focus of natural selection, such as reading a book or driving a car (Sherry & Schacter, 1987). Put more generally, exaptation reminds us that the evolution of culture must reflect some degree of match with, and reciprocal influence on, evolution-based genetic disposition (Durham, 1991; Gottlieb et al., Chapter 5, this *Handbook,* this volume). For instance, pragmatic knowledge may evolve from and/or mimic predisposed knowledge in evolutionarily privileged domains but come with the advantage of being tuned to the idiosyncratic demands of specific cultures, biographies, and contexts (Siegler & Crowley, 1994).

Note, however, that culture sometimes appears to have produced bodies of knowledge that are antithetical, disconnected, or at least not easily articulated to biological predispositions. For instance, Gigerenzer and Todd (1999) have argued that formal-logical expressions such as Bayes' theorem do not take advantage of humans' predisposition to base judgments about feature conjunction probabilities on frequency counts. Put differently, mathematical formalisms about conditional probabilities do not build on mechanisms of perception and action that directly support the detection of conjunctive feature frequencies; rather, such formalisms are cultural products whose acquisition requires specialized instruction. Another example from a completely different field is the need to culturally countershape the manifestation of evolution-based aggressive and interpersonal power tendencies.

Normative versus Person-Specific Pragmatic Knowledge

An important, albeit necessarily imperfect, distinction within the pragmatics of cognition concerns normative versus person-specific knowledge. Normative bodies of knowledge are of general value to a given culture. Typical examples include verbal ability, number proficiency, and basic general knowledge about the world (e.g., Ackerman, Beier, & Bowen, 2000). Individual differences in these domains are closely linked to years of education and other aspects of social stratification, and are amenable to psychometric testing (Cattell, 1971). In contrast, person-specific bodies of knowledge that branch off from the normative knowledge-acquisition path are less closely tied to mandatory socialization events, and result from specific combinations of experiential settings, personality characteristics, motivational constellations, and cognitive abilities or talent (Marsiske et al., 1995). As a consequence, these bodies of knowledge often escape psychometric operationalization, and are more amenable to study within the expertise paradigm (Ericsson & Smith, 1991; Gobet et al., 2001; Krampe & Baltes, 2003). Therefore, psychometric research on crystallized abilities needs to be supplemented by approaches with a more explicit focus on knowledge acquisition and utilization to more fully capture the diversity and specificity of pragmatic knowledge.

For the most part (but see Brown, 1982; Chi & Koeske, 1983; Schneider & Bjorklund, 2003; Weinert & Perner, 1996; Wilkening & Anderson, 1990), developmental research on person-specific bodies of knowledge has been undertaken with adults. A typical approach has been to identify the effects of domain-specific knowledge by comparing the performance of experts and novices both inside and outside their domain of expertise. Examples include the classical domains of expertise research such as chess (Charness, 1981) and card games (Bosman & Charness, 1996), but also domains such as baseball knowledge (Hambrick & Engle, 2002) or professional expertise (e.g., Salthouse, 2003; for an overview, see Charness, 2005).

Two main conclusions can be drawn from this research. First, expertise effects, or the consequences of specific bodies of declarative and procedural knowledge, rarely transcend the boundaries of the target domain. Specifically, there is little evidence to suggest that the mechanics of cognition are transformed by domain-specific knowledge (Salthouse, 2003). Whenever there is evidence for effects of a more general kind, at least after the age periods of childhood and adolescence, transfer of pragmatic knowledge (positive or negative) appears to be a more plausible explanation than a basic change in the mechanics. One example comes from longitudinal work by Kohn and Schooler (1983; Schooler, Mulatu, & Oates, 1999) on the relationship between the substantive complexity of work and ideational flexibility. Kohn and Schooler found that work complexity predicts increments in ideational flexibility over a period of 10 years, even after controlling for initial differences in ideational flexibility. A related finding is the recent observation that social participation attenuates decline in the cognitive mechanics in old and very old age (Lövdén, Ghisletta, & Lindenberger, 2005). Note, however, that the interpretation of findings of this type in terms of experiential factors is complicated through nonrandom placement of individuals into experiential settings and the fact that the measures of the cognitive mechanics used include crystallized pragmatic components (Scarr & McCartney, 1983).

The second major conclusion concerns the power of pragmatic knowledge to make up for losses in the mechanics within the domain of expertise (Charness, 2005; Krampe & Baltes, 2003). Here, the results from several studies suggest that acquired knowledge endows aging individuals with a form of natural and local (e.g., domain-bound) ability to withstand or at least attenuate the consequences of aging-induced losses in the mechanics. This finding is of central importance for the issue of successful intellectual aging, and supports the general life span theory of selective optimization with compensation (P. B. Baltes, 1993; Freund & Baltes, 2000; Staudinger et al., 1995). The postulate of a compensatory relation between pragmatic knowledge acquisition and mechanic decline receives additional support by attenuated adult age differences in knowledge-rich domains of everyday relevance. For instance, compared to standard psychometric or cognitive-experimental assessments, negative adult age differences tend to be less pronounced or absent in practical problem solving (Sternberg, Wagner, Williams, & Hovath, 1995), social intelligence (Blanchard-Fields, 1996), memory in context (Hess & Pullen, 1996), and interactive-minds cognition (P. B. Baltes & Staudinger, 1996b; Dixon & Gould, 1996; T. Singer et al., 2004; Staudinger, 1996; Staudinger & Baltes, 1996).

Intellectual Growth during Adulthood: Stage Conceptions versus Functionalist Approaches

Historically, much of the search for more advanced forms of reasoning and thought in adulthood originated from Piaget's theory of cognitive development (Chapman, 1988b; Pascual-Leone, 1983; Piaget, 1970; Riegel, 1976), positing the emergence of one or more postformal or dialectical stages of cognitive development after the advent of formal operations. The conceptual description of these stages often connects personality development (e.g., generativity in the Eriksonian sense) with logical considerations (e.g., awareness and acceptance of contradiction). As a consequence of this particular linkage, the emergence of such stages is assumed to bring about increments in reflexivity and general awareness for the human condition (see the next section). Evidence in support of such stages is scarce, which is not surprising given the difficulties in obtaining reliable indicators of stage-like cognitive change (e.g., Molenaar, 1986; L. B. Smith & Thelen, 2003).

Despite his constructivist and dialectical epistemology (e.g., Chapman, 1988; Lourenço & Machado, 1996; Piaget, 1980), Piaget himself was reluctant to posit any stages beyond formal operations. Instead, he argued on one occasion (Piaget, 1972) that the notion of horizontal décalage gives sufficient room to adult intellectual growth and variability within his theory. Specifically, he expected that late adolescents and adults would exhibit formal-operational reasoning within their areas of expertise but not necessarily across all possible domains of knowledge. This view seems consistent with the two-component model of fluid-crystallized or mechanic-pragmatic intelligence in that the potential for adult intellectual growth is linked to factors operating within rather than across domains (Flavell, 1970; Krampe & Baltes, 2003).

Nevertheless, the quest for identifying structural transformations in the organization of thought and action in the course of life span development continues to be of great theoretical appeal (L. B. Smith & Thelen, 2003). To ease the detection of such transformations, if they exist, it seems advisable to increase the density of observations within persons, and to use data-analytic tools as well theoretical approaches that highlight rather than cover the structural dynamics one seeks to identify (e.g., Lindenberger & von Oertzen, in press; Molenaar,

Huizenga, & Nesselroade, 2003; C. S. Nesselroade & Schmidt McCollam, 2000). Empirically, the emergence of automaticity during skill acquisition provides perhaps the best evidence for structural change (e.g., Ackerman & Cianciolo, 2000), albeit of a different kind than envisioned by structuralist life span theoreticians.

Expanding the Concept of Cognitive Pragmatics: Wisdom as Expertise in the Fundamental Pragmatics of Life

Individual differences in intellectual functioning also reflect and influence individual differences in personality and motivation. In the child development literature, a good example is school achievement, which is studied in relation to ability, effort, and other personality characteristics. In life span psychology, such a view becomes conspicuous when attempting to understand expert levels of intellectual performance, for instance, by means of models of expertise (Ericsson & Smith, 1991). Similarly, investment theories of intelligence emphasize that cognition pervades cognitive, motivational, and emotional aspects of behavior (Krampe & Baltes, 2003).

To illustrate the point of viewing intelligence in a larger context of human functioning, we use research on wisdom (see also P. B. Baltes & Kunzmann, 2004; Kunzmann & Baltes, 2003a). Wisdom is close to conceptions of intelligence broadly conceived, as it denotes a high level of performance in the domain of practical and social intelligence. At the same time, wisdom also is a personality characteristic since its acquisition and expression depends on values and motivation. For instance, it is part of wisdom-related knowledge to understand that wisdom is oriented simultaneously toward the well-being of oneself and that of others. This commitment to the common good highlights the constituent role of personality and motivation in wisdom-related thought and behavior. Hence, we see wisdom as an ideal combination of mind and virtue (P. B. Baltes & Kunzmann, 2004; P. B. Baltes & Smith, 1990; P. B. Baltes & Staudinger, 2000). Cognitive, motivational, and emotional attributes need to converge to produce wisdom as the highest form of human excellence in mind and character. Thus, strictly speaking, intelligence is only a part of wisdom, unless one was to expand the concept of intelligence production to cover personality as well (for a further discussion of these issues, see Ardelt, 2004; Aspinwall & Staudinger, 2003; P. B. Baltes & Kunzmann, 2004; Krampe & Baltes, 2003; Sternberg, 2004).

In the Berlin work on wisdom (e.g., P. B. Baltes & Kunzmann, 2004; P. B. Baltes & Smith, 1990; P. B. Baltes & Staudinger, 2000), we treat wisdom as the highest form of knowledge and judgment about human excellence involving the meaning and conduct of life. Specifically, we define wisdom as "an expertise in the fundamental pragmatics of life permitting exceptional insight and judgment involving complex and uncertain matters of the human condition including its developmental and contextual variability, plasticity, and limitations." Operationally, this definition corresponds to a family of five criteria, factual knowledge, procedural knowledge, contextualism, value relativism, and uncertainty. Clearly, advances along these dimensions require the joint operation of cognitive, motivational, and emotional factors.

Thus far, our main methodological strategy in investigating wisdom as an expertise in the fundamental pragmatics of life has been to ask persons to think aloud about difficult life problems such as, "Imagine a 14-year-old girl who wants to leave home and get married, what should one think about this?" The think-aloud responses to such or similar life problems are then evaluated on the five wisdom-related criteria by a trained rater panel. Figure 11.12 displays the results of one of these studies (P. B. Baltes, Staudinger, Maercker, & Smith, 1995). In the figure, an overall wisdom score

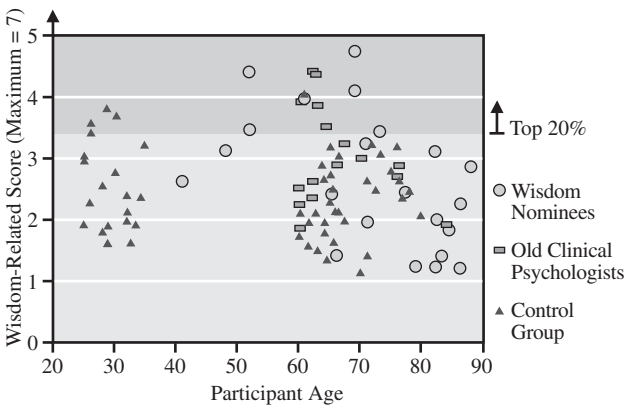


Figure 11.12 Wisdom-related performance of four different groups of individuals averaged across two wisdom-related tasks and five evaluative criteria (factual knowledge, procedural knowledge, contextualism, relativism, and uncertainty). There were no age differences in the age range from 25 to 80 years. In addition, wisdom nominees and clinical psychologists provided significantly more high-level (top 20%) performances than the old control group. Max. = maximum. *Source:* From "People Nominated as Wise: A Comparative Study of Wisdom-Related Knowledge," by P. B. Baltes, U. M. Staudinger, A. Maercker, and J. Smith, 1995, *Psychology and Aging, 10,* pp. 155–166.

based on all five criteria is plotted against age for four different groups: Wisdom nominees (i.e., distinguished individuals nominated as being wise in a two-step Delphi technique), experienced clinical psychologists, and two control groups involving adults with comparable advanced levels of education (young and old).

Two findings are noteworthy. First, there was no indication of a negative age trend in wisdom-related performance when comparing adults of about 25 to 75 years of age. This finding has been replicated in five other studies (Staudinger, 1999a). Second, older persons with wisdom-facilitative experiences (e.g., older clinical psychologists and wisdom nominees) contributed a disproportionately large share to the top responses (see also J. Smith, Staudinger, & Baltes, 1994; Staudinger, Smith, & Baltes, 1992). Both findings stand in clear contrast to the negative age gradients observed for the cognitive mechanics (see Figure 11.10, both panels), thereby providing further support for the two-component model.

The findings also underscore that living long (age) in itself is not a sufficient condition for the development of wisdom (or for any other form of expertise). Rather, as suggested by our working model of wisdom ontogeny (see Figure 11.13), it appears that favorable macrostructural contexts (e.g., historical period), expertise-specific factors (e.g., experience and training in the fundamental pragmatics of life, strive for excellence, mentorship), and general person factors (e.g., fluid mechanics, cognitive style, openness to experience) need to work in coalition to move people toward wisdom (e.g., Staudinger, 1999b). Some of these wisdom-facilitative factors, such as generativity, are age-associated; however, there are also wisdom-debilitating influences, such as rigidity and decrease in the cognitive mechanics, that might come with age. On average, the net result of age-related facilitators and debilitators seems to equal out. Only under favorable conditions, facilitators outweigh debilitators and permit increase of wisdom-related performance with age.

The theoretical framework of our work on wisdom, and its close connection with dimensions of personality and emotionality, has been supported by a variety of findings (P. B. Baltes & Kunzmann, 2004; P. B. Baltes & Staudinger, 2000; Kunzmann & Baltes, 2003b). For instance, in adulthood, personality and cognitive style measures are more important predictors of wisdom-related performance than traditional measures of intelligence (Staudinger, Lopez, & Baltes, 1997; Staudinger,

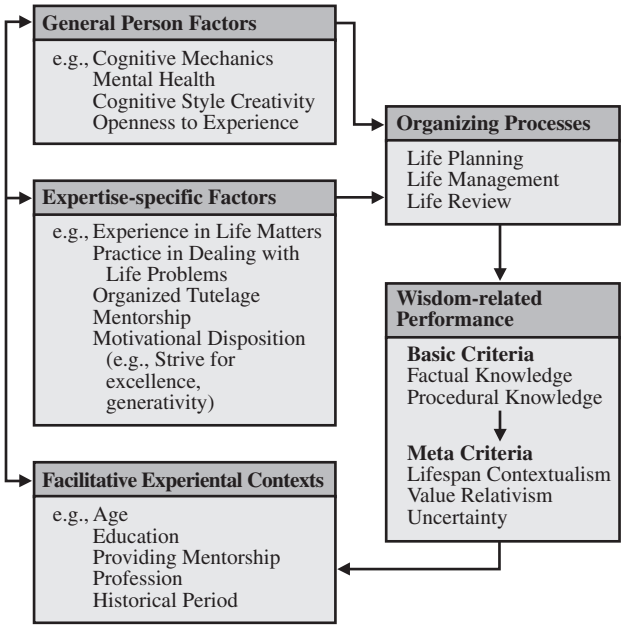


Figure 11.13 A research framework describing antecedent factors and mediating processes for the acquisition and maintenance of wisdom-related knowledge and skills across the life span. The likelihood of attaining expert levels of performance in this prototypical domain of the cognitive pragmatics is assumed to depend on an effective coalition of experiential, expertise-specific, and general person-related factors (modified after Baltes & Smith, 1990; Baltes & Staudinger, 2000). Adapted from "The Psychology of Wisdom and Its Ontogenesis" (pp. 87–120), by P. B. Baltes and J. Smith, 1990, in *Wisdom: Its Nature, Origins, and Development,* R. J. Sternberg (Ed.), New York: Cambridge University Press; and "Wisdom: A Metaheuristic to Orchestrate Mind and Virtue Towards Excellence," by P. B. Baltes and U. M. Staudinger, 2000, *American Psychologist, 55,* pp. 122–136.

Maciel, Smith, & Baltes, 1998). In contrast, intelligence is a more salient predictor in adolescence, when intellectual prerequisites for wisdom-related characteristics such as the abilities to self-reflect and decenter are undergoing rapid developmental advances (Pasupathi, Staudinger, & Baltes, 2001). To embed wisdom into a more holistic context involving personality and the self, we also examined the correlation between wisdom-related knowledge and virtue-related outcomes such as prosocial values and interpersonal conflict-resolution styles (Kunzmann & Baltes, 2003b; see also Sternberg, 1998). People high on wisdom-related knowledge exhibited a more complex and modulated structure of emotions and preferred conflict resolution strategies that are based on dialogue rather than power. Of special interest is that high wisdom-related knowledge correlates nega-

tively with the search for personal enjoyment and material happiness.

In addition to illustrating how the pragmatics of cognition are intertwined with other sectors of human development, our research on wisdom also illustrates how culture and culture-based activities shape development during adulthood. During normal adulthood, the biology of the body and brain is sufficiently developed and ready for investment. It is culture-based learning and development that defines the agenda (see also P. B. Baltes, Freund, & Li, in press; Lachman, 2001). In this sense, work on wisdom serves to highlight the *relative independence of the pragmatics of cognition vis à vis the biology-based mechanics.* Within the normal range of adult mechanic functioning, the mechanics' contribution to individual differences on wisdom-related tasks is small, both in absolute terms and relative to other factors such as personality and task-relevant life experience. The most important contributors to wisdom-related performance during the adult life span tend to be personality characteristics as measured by the Neuroticism Extraversion Openness Questionnaire (NEO) as well as wisdom-relevant professional training and the nature of lifetime experience, rather than psychometrically assessed intelligence or chronological age. In very old age, however, the mechanics of cognition again appear to delimit wisdom-related performance if they fall below a critical threshold of functional integrity (P. B. Baltes et al., 1995).

Varieties of Mechanic/Pragmatic Interdependence

As has become clear by now, the mechanics and pragmatics of life span intellectual development are intertwined in many ways and at various levels of analysis (cf. Charness, in press; Salthouse, 2003), both among each other and with other aspects of behavior. Phylogenetically, they are connected in the sense that members of the human species are biologically predisposed to acquire cultural knowledge (e.g., Plessner, 1965; Wellman, 2003). Ontogenetically, the interdependence also runs both ways. For instance, the potential to acquire and use pragmatic knowledge is conditioned by the development of the mechanics. At the same time, mechanics alone are of little use for problem solving in highly specialized domains of knowledge; in many cases, domain-specific knowledge is critical (Gobet et al., 2001).

In the following discussion, we further elucidate different facets of this interdependence. This approach is in line with the view of biocultural co-construction (P. B. Baltes et al., 2006; S.-C. Li, 2003) mentioned earlier. We then argue, with respect to the overall landscape of life span development, or the ontogenetic dynamics of gains and losses, that the mechanic-pragmatic interdependence converges on the notion of a *compensatory relation between mechanic efficiency and pragmatic knowledge.* As SOC theory suggests, this compensatory relation is reciprocal and part of the entire life course. However, we submit that the role of compensation increases in importance and culminates in old age.

The Mechanic-Pragmatic Interdependence: Evidence at the Cortical Level

An early neurocognitive demonstration for the interdependence between mechanic and pragmatic development concerns the increased cortical representation of the left hand in players of string instruments (Elbert, Pantev, Wienbruch, Rockstroh, & Taub, 1995; for other examples, see Draganski et al., 2004; Petersson & Reis, in press). Compared to normal individuals, areas of the somatosensory cortex representing the fingers of the left hand occupy more space in string players. Most likely, this increase in cortical representation has been induced by large amounts of goal-directed and deliberate practice (cf. Ericsson, Krampe, & Tesch-Römer, 1993). In line with the notion of a bio-culturally co-constructed brain (P. B. Baltes et al., in press; S.-C. Li & Lindenberger, 2002), this research finding illustrates the potential of individuals to acquire and represent pragmatic knowledge.

Elbert et al. (1995) also provided evidence in support of age-graded differences in cortical plasticity. Specifically, the brain's physiological aptness to provide more cortical space for the fingers of the left hand was found to depend on the chronological age at inception of musical practice. As this example illustrates, the ability to acquire pragmatic knowledge (e.g., the potential for developmental change in the pragmatic component) is conditioned by the age-graded status of the mechanics (Güntürkün, in press; Kempermann, in press).

The Age of Peak Performance in Complex Skills

The mechanics of cognition not only condition the acquisition but also the expression of pragmatic knowledge, especially at high levels of performance (Bosman & Charness, 1996; Hambrick & Engle, 2002; Molander & Bäckman, 1993). A good example is the difference in

peak age for tournament versus correspondence chess (Charness, in press). The mean age at which a world championship is first won is about 46 years of age for correspondence chess, but about 30 years of age for tournament chess. In correspondence chess, players are permitted 3 days to deliberate a move; in tournament chess, deliberation averages three minutes per move. Thus, the difference in peak age between the two activities seems to reflect differences in the relative importance of cognitive/perceptual speed and knowledge (e.g., Burns, 2004).

This example points to a general dilemma governing the relation between the mechanics, the pragmatics, and age/time. The acquisition of expertise takes time. For instance, Simon and Chase (1973) argued that 10 years of deliberate practice are needed to reach excellence in a particular domain of functioning. For this reason alone, experts tend to be older than novices (cf. Lehman, 1953). On the other hand, decrements in certain aspects of the mechanics, such as perceptual speed, can be reliably identified by age 30 (S.-C. Li, Lindenberger, et al., 2004; Salthouse, 1991). Therefore, differences in peak age across domains can be seen as ontogenetic compromises between biology and culture, and are probably good indicators of the relative importance of pragmatic knowledge and mechanic processing efficiency.

An exclusive focus on ages of peak productivity or peak achievement would hide essential and unique features of late-life intellectual growth. For instance, some exceptional individuals seem to escape mechanic decline well into the 9th decade of their lives. If these individuals also happen to be experts in a particular domain, they can produce outstanding works throughout their life. One example would be Sophocles (497–406B.C.), who won his first prize for the best drama of the year at age 28, wrote over 120 dramas, and developed a new dramatic style in his 80s. Commenting on his own late-life artistic development, Sophocles said that he finally had liberated himself from the artificiality of his earlier style, and had found a language that was the best and the most ethical (Schadewaldt, 1975, p. 75; for related evidence on classical composers, see Simonton, 1988, 1989).

A Third Prototypical Example: Speed and Knowledge in Aging Typists

A good empirical demonstration of the gain/loss dynamic between the cognitive mechanics and the cognitive pragmatics comes from a study on aging typists using the so-called molar equivalence/molecular decomposition approach (Salthouse, 1984). In this paradigm, adults of different ages are equated in general (e.g., molar) task proficiency to investigate whether equal levels of criterion performance are attained through age-differential profiles of "molecular" component processes (Charness, 1989). Thus, age differences at the molecular level of analysis are seen as a reflection of age-based changes in the relative contribution of knowledge and basic processing efficiency to criterion performance.

Salthouse (1984) studied a total of 74 transcription typists ranging from 19 to 72 years of age. Figure 11.14 displays an interpretation of the main findings of this study in terms of the two-component model. In this sample, age and level of typing skill (i.e., net words per minute) were uncorrelated (e.g., molar equivalence). Age was negatively related to measures of perceptual/motor speed (e.g., tapping speed), but positively related to eye-hand span. In other words, older typists were slower in tapping speed but looked further ahead in the text to be typed. These findings are consistent with the interpretation that aging typists extend their eye-hand span to counteract the consequences of aging losses in perceptual/motor speed, and illustrate the compensatory relationship between knowledge and speed.

To the extent that selective attrition does not play a prominent role, the performance pattern of older typists may, in part, reflect *loss-induced development,* or compensation in the strict sense of the term (P. B. Baltes & Baltes, 1990b; Dixon & Bäckman, 1995; Salthouse, 1995). With respect to methods, this example

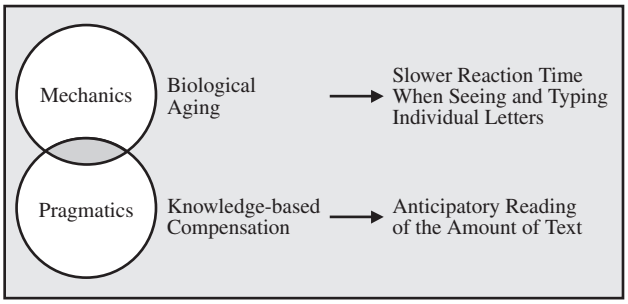


Figure 11.14 Older typists can maintain a high level of functioning by reading farther ahead in the text to be typed, despite a loss in reaction time when typing individual letters. The example illustrates the compensatory relationship between the pragmatics and the mechanics of cognition and suggests that selective optimization with compensation may play an important role in successfully adapting to aging-induced losses in the mechanics of cognition. *Source:* From "Effects of Age and Skill in Typing," by T. A. Salthouse, 1984, *Journal of Experimental Psychology: General, 113,* pp. 345–371.

demonstrates how the combination of expertise and information-processing approaches may lead to a better understanding of the compensatory relation between acquired bodies of cultural knowledge and basic aspects of information processing efficiency (cf. Abraham & Hansson, 1995; Lang et al., 2002).

Malleability (Plasticity) in Intellectual Functioning across Historical and Ontogenetic Time

As is true for development in general, life span changes in intellectual functioning represent the overdetermined antecedents, correlates, and outcomes of a large variety of different sources of influence (e.g., mechanics, pragmatics, motivation, personality, societal opportunity structures). Therefore, differences in level of intellectual performance reflect, within the age-graded boundaries provided by the mechanics, variations in physical and sociocultural aspects of environmental conditions (P. B. Baltes et al., in press; Klix, 1993). In the following, we report two interrelated lines of research in support of this contention. The first line of research addresses environmental change at a large (i.e., historical) time scale. The second example refers to the malleability of adult-intellectual functioning in the context of cognitive intervention studies.

Cohort Effects, Period Effects, and Environmental Change

As expected on the basis of life span contextualism, ontogenetic processes unfold in a constantly changing social and cultural environment. As a consequence, age gradients in intellectual abilities are not fixed but reflect history-graded systems of influence, such as enduring differences between individuals born at different points in historical time (cohort effects), specific influences of historical events across chronological age (period effects), or generalized and enduring shifts in the environment affecting individuals of all ages and subsequent cohorts (general environmental change). For methodological reasons, discriminating among these varieties of environmental change is not easy (P. B. Baltes, 1968; P. B. Baltes et al., 1979; Lövdén, Ghisletta, & Lindenberger, 2004; Magnusson et al., 1991; Schaie, 1965, 1994, 2005).

A first step to discern effects of large-scale environmental change is to compare the performance of same-aged individuals across historical time (i.e., time-lagged comparisons). With some exceptions (e.g., number ability; cf. Schaie, 1989; Schaie et al., 2005), the general picture resulting from such comparisons is that higher test scores are obtained at more recent times (Flynn, 1987; Schaie, 1996). Probably, this historical increase in test scores across historical time is not due to changes in the genetic composition of the population or differential sampling bias, but reflects some general change (i.e., improvement) in health- and education-related conditions. The magnitude of these effects can be quite large. For the U.S. population during the twentieth century, for instance, they sometimes exceeded a standard deviation within a 30-year range of historical change (Schaie, 1996). It should be cautioned, however, that we do not know whether environmental-change effects of the same order of magnitude would be observed with pure indicators of the mechanics of intelligence. For instance, much of the measures used in the battery of the Seattle Longitudinal Study (Schaie, 1996) have a strong cultural-knowledge component, and are more likely to be affected by historical change and dissipation than other, less knowledge-loaded measures of brain efficiency. With respect to the Seattle Longitudinal study (Schaie, 1996), the convergence between cross-sectional and independent-sample same-cohort comparisons suggests that the more positive age gradients found with longitudinal samples may be partly due to practice effects and selective attrition (see also Salthouse, 1991). Analyses of longitudinal data from the Berlin Aging Study (BASE) are fully consistent with both predictions (Lindenberger, Singer, & Baltes, 2002; Lövdén, Ghisletta, & Lindenberger, 2004; T. Singer, Verhaeghen, et al., 2003).

Theoretically, the direction and precise magnitude of historical-change effects is generally of little importance. From a history-of-science point of view, however, such effects, and especially their interpretation as culture-based cohort effects, were instrumental in pointing to the substantial malleability (plasticity) of intellectual performance during all periods of the adult life span (P. B. Baltes, 1973). The resulting growth in awareness for the existence of life span plasticity eventually led to advances in life span theorizing, and to more controlled investigations into the range of intellectual plasticity and its age-based limits (P. B. Baltes & Kliegl, 1992; P. B. Baltes & Lindenberger, 1988; P. B. Baltes & Willis, 1982; T. Singer, Lindenberger, & Baltes, 2003; Willis, 1990). Specifically, multidirectional cohort differences in intellectual trajectories may entice interdisciplinary collaboration with medicine and nutritional sciences, educational neuroscience, and sociology

to understand their proximal antecedents and consequences (Schaie et al., 2005).

Cognitive Intervention Work: Activation of Learning Potential among Older Adults

Intervention work (P. B. Baltes & Willis, 1982; Kramer & Willis, 2002; Willis, 2001) is a more direct (i.e., experimentally controlled) way to explore the degree of plasticity in intellectual functioning than cohort-comparative research. In the field of adult development and aging, intervention studies have been undertaken to examine whether age-based decrements in standard psychometric tests of intellectual functioning are reversible, in full or in part, through training and practice (Willis & Nesselroade, 1990). For the most part, interventions involved older adults only, and focused on tests from the broad fluid domain.

The major results of this cognitive intervention work can be summarized in five points (e.g., P. B. Baltes & Lindenberger, 1988; Kramer & Willis, 2002): (1) Training gains in the practiced tests among healthy older adults are substantial (i.e., they roughly correspond to the amount of naturally occurring longitudinal decline between 60 and 80 years of age); (2) transfer, however, is limited to similar tests of the same ability; (3) training gains are maintained over lengthy periods of time up to several years (Neely & Bäckman, 1993; Willis & Nesselroade, 1990); (4) the factor structure of the ability space is not altered substantially through training (Schaie, Willis, Hertzog, & Schulenberg, 1987); and (5) in persons at risk for Alzheimer's disease or afflicted by other forms of brain pathology, training gains have been found to be restricted to experimental conditions of high external support (Bäckman, Josephsson, Herlitz, Stigsdotter, & Viitanen, 1991) or to be nonexistent (M. M. Baltes et al., 1995; M. M. Baltes, Kühl, & Sowarka, 1992).

These results indicate that the majority of healthy older adults, including those who display the typical pattern of age-related losses in the mechanics of cognition (e.g., fluid abilities) under untrained conditions, are able to greatly improve their performance after a few sessions of task-related training or practice. Thus, among healthy older adults, the mechanics of cognition are sufficiently preserved to permit the acquisition of task-relevant declarative and procedural knowledge. However, there is little evidence to suggest that training gains generalize to related abilities or to everyday functioning. Moreover, the results of testing-the-limits research presented above clearly indicate that the *amount* (scope) of plasticity decreases with advancing age, at least during adulthood. At limits of mechanic functioning, older adults definitely display less potential. To what degree such cognitive training in older adults changes the mechanics themselves is unclear but possible (Kempermann, 2006).

A related line of intervention research has found that aerobic fitness attenuates age-related decrements in cognitive control (e.g., multitasking) in later adulthood (Kramer et al., 1999). This finding can be explained in at least two ways. First, from the perspective of SOC theory, increasing bodily fitness may reduce older adults' needs to continuously invest portions of their cognitive resources into the coordination of their increasingly fallible sensory and motor functions (e.g., Lindenberger et al., 2000). In other words, training the sensamotor function required for bodily functioning "frees" up resources for other cognitive tasks. Second, recent brain-imaging evidence suggests that aerobic fitness has direct beneficial effects on prefrontal cortex functioning (Colcombe et al., 2003), which may enhance performance on cognitive tasks that put high demands on cognitive control. Clearly, the two explanations are not mutually exclusive.

Relative Stability in Intellectual Functioning across the Life Span

The issue of continuity and discontinuity, or stability and change, has a long tradition within developmental psychology at large (Kagan, 1980), and life span intellectual development, in particular (P. B. Baltes & Smith, 2003; Hertzog, 1985; Lövdén & Lindenberger, 2004; McArdle & Epstein, 1987; J. R. Nesselroade, 1991; Schaie, 1965). Different forms of stability, such as stability in level, rank order, and profiles, have been set apart (Caspi & Bem, 1990). The main emphasis of the following life span synopsis of intellectual development is on interindividual rank order, or on what Kagan (1980) has called relative stability, which denotes the extent to which individual differences during later periods of ontogeny can be predicted on the basis of individual differences observed during earlier periods.

In most cases, evidence on the relative stability after infancy is based on undifferentiated measures of general intelligence, or IQ tests. We agree with others that an exclusive focus on these omnibus measures hides essential features of life span intellectual development and

the structure of intelligence (Cattell, 1971; Horn, 1989). Specifically, such measures can be seen as mixtures of mechanic and normative-pragmatic components of intellectual functioning that approximate, to varying degrees, the centroid of the intellectual ability factor space (i.e., Spearman's g). With this qualification in mind, we restrict the following discussion, with one exception (i.e., infant development), to undifferentiated or IQ-like measures of intellectual functioning.

Predicting Childhood Intelligence on the Basis of Infant Behavior

Until the 1950s, it was generally believed that intelligence was an immutable characteristic of the individual, which led to the unchallenged assumption that individuals maintain their rank order on measures of intellectual functioning throughout life. Starting in the 1960s, however, it was found that stability in early mental test performance was low (McCall, 1979). On the basis of this evidence, it was concluded that standardized tests of infant development do not predict later intelligence at useful levels of prediction until after 18 to 24 months of age. This majority view of ontogenetic instability of interindividual differences during infancy was again challenged and ultimately replaced by more recent research using habituation and recognition-memory paradigms. In contrast to standardized infant tests of sensorimotor capacities, these two paradigms were originally based on operant-conditioning and/or information-processing perspectives, and refer to infants' tendency to change their behaviors as a function of prior exposure to a stimulus (e.g., decrements in attention in the case of habituation, or novelty preference in the case of recognition memory). On average, individual differences in habituation and recognition memory performance between 2 and 8 *months* were found to be moderately correlated with standard tests of intelligence such as the Wechsler, Bayley, or Binet administered between 1 and 8 *years* (median correlation, $r = .45$; after attenuation for unreliability, $r = .70$; Bornstein, 1989; McCall & Carriger, 1993; for recent evidence, see F. Smith, Fagan, & Ulvund, 2002). A more recent meta-analysis has confirmed these results (Kavsek, 2004). Behavior-genetic research suggests that individual differences in at least some of the measures used for prediction have a genetic component (Benson, Cherny, Haith, & Fulker, 1993; Cardon & Fulker, 1991).

Both relative change *and* relative stability shape life span intellectual development from its very beginning. According to one interpretation (e.g., Bornstein, 1989), infants who habituate more efficiently, and who tend to look at the novel object, rather than the old, are better able to inhibit action tendencies associated with already existing representations (e.g., Diamond, 2002; McCall, 1994). The hypothesis that inhibition may mediate the predictive link is consistent with neuropsychological investigations of infants' recognition memory (e.g., Diamond, 2002; Johnson, Posner, & Rothbart, 1991). It also supports the more general claim that inhibition ability and novelty preference are central features of intelligence (Berg & Sternberg, 1985a).

Relative Interindividual Stability after Infancy

For reasons that are not yet well understood (Cardon & Fulker, 1991; McCall & Carriger, 1993), the magnitude of the correlation between infant measures of habituation (i.e., 2 to 8 months) and childhood measures of intelligence (i.e., 1 to 12 years) is temporally stable or even increasing (Cardon & Fulker, 1991), rather than decreasing over time. In contrast, relative stability after infancy is rather well described on the basis of quasi-simplex assumptions (Humphreys & Davey, 1988; Molenaar, Boomsma, & Dolan, 1991). Thus, adjacent time points in ontogeny tend to be more highly correlated than more distant time points In addition, stability coefficients computed over identical lapses of time show a considerable increase in magnitude from childhood to adolescence into middle adulthood and early old age (Hertzog & Schaie, 1986, 1988; Humphreys & Davey, 1988; for review, see Lövdén & Lindenberger, 2004).

In agreement with others (e.g., Humphreys & Davey, 1988; Molenaar, Boomsma, & Dolan, 1993), we propose that these *age-based changes in relative interindividual stability should be interpreted in connection with age-based changes in level* (e.g., Lövdén & Lindenberger, 2004). According to this line of reasoning, interindividual differences change more rapidly early in development because the intellectual repertoire is smaller but growing faster than at later points during ontogeny, thereby giving room for larger amounts of new variance per unit time (both environmental and genetic). By the same token, aging-induced losses and age-associated pathologies (e.g., Alzheimer's disease) may not only lead to decrements in level but also to a reshuffling of individual differences in very old age (Mitrushina & Satz, 1991; cf. P. B. Baltes & Smith, 2004).

Changes in Heritability across the Life Span

We now turn to the study of age-based changes in the contribution of genetic and environmental sources of interindividual variability to individual differences in intelligence. We start with a consideration of general and ability-specific effects, and then turn our attention to life span changes in heritability estimates for general (i.e., undifferentiated) measures of intelligence across the life span.

A Note on the Nature of Behavior-Genetic Evidence

Before we summarize the relevant evidence, we will sketch out our views on the meaning, strength, and limitations of the behavior-genetics approach (P. B. Baltes et al., 1988). Given the critical debates surrounding the interpretation of behavior-genetic data (e.g., Bronfenbrenner & Ceci, 1994; Gottlieb et al., Chapter 5, this *Handbook,* this volume; R. M. Lerner, 1995; Molenaar et al., 2003; Scarr, 1993), such a note may help to avoid possible misunderstandings. We restrict our comment to three points that are relevant both for the following section on intellectual functioning as well as on personality and the self. More detailed treatment is provided in P. B. Baltes et al. (1998).

First, heritability coefficients in human research (where selective inbreeding and exposure to extreme environments is limited) are statements about the scope of interindividual differences more so than statements about the processes and mechanisms of genetic expression at the individual and intraindividual level of analysis. In other words, population-based behavior genetics provides clues about the existence of genetically based variation in a given population but does not provide direct evidence about gene locations or epigenetic events producing this variation (for emerging links between behavior and molecular genetics, for example, Dick & Rose, 2002; de Geus & Boomsma, 2002).

Second, standard behavior-genetic models do not provide the best test of the overall role of environmental forces. The power of such forces is better tested by studies that examine the role of the impact of environmental factors across the population and across interindividual differences in genetic make-up. Specifically, high heritability estimates do not preclude the existence of environmental factors that alter performance levels in all individuals of a given sample (for an experimental demonstration, see Fox, Hershberger, & Bouchard, 1996).

Third, heritability estimates are fixed-level statistics (P. B. Baltes et al., 1988; Plomin & Thompson, 1988), indicating what consequences (phenotypic expressions) are produced under a given and specific set of interindividual differences in genetic and environmental conditions. Strong evidence demonstrating the environmental malleability of heritability estimates comes from data on 7-year-old twins participating in the National Collaborative Perinatal Project (Turkheimer, Haley, Waldron, D'Onofrio, & Gottesman, 2003). A substantial proportion of the twins in this sample were raised in families living near or below the poverty level. The authors found that the proportions of IQ variance attributable to genes and environment varied nonlinearly with socioeconomic status. In impoverished families, the shared environment accounted for 60% of the variance in IQ, and the contribution of genes was close to zero. In affluent families, the result was almost exactly the reverse. Apparently, factors associated with low socioeconomic status such as deprivation from developmental opportunity structures hindered the behavioral expression of genetically based interindividual differences in intellectual functioning.

Despite these qualifications, behavior-genetic evidence provides important information about sources of interindividual differences in life span development, especially if linked to molecular research on specific genetic polymorphisms (Goldberg & Weinberger, 2004), to intermediate phenotypes at the level of brain organization (e.g., Anokhin et al., in press), or both. Such findings, especially if based on longitudinal (e.g., Finkel, Pedersen, McClearn, Plomin, & Berg, 1996), experimental (e.g., Fox et al., 1996), and cross-cultural (e.g., Turkheimer et al., 2003) data, provide *estimates* of the degree to which, on a population level of analysis, *interindividual differences in developmental outcomes* are co-determined by interindividual differences in genetic predispositions and extant environmental variations. Thus, everything else being equal, high heritability estimates of a given behavioral outcome suggest that *interindividual differences* in this behavioral outcome and in this "life space" are strongly genetically determined than *interindividual differences* in behavioral outcomes with low heritability estimates.

Genetic and Environmental Influence over Ontogenetic Time: Specific and General Effects

Numerous studies have shown that genetic and environmental influences can be operative in the regulation of individual differences at both ability-specific and more

general levels (e.g., Cardon & Fulker, 1994). In longitudinal analyses of hierarchically organized intellectual abilities obtained from genetically informative data sets, it is possible to determine the genetic and environmental contributions to stability and change in rank order and mean level both at the level of specific abilities and at the level of a general factor (e.g., Cardon & Fulker, 1994). An interesting example for the class of findings that can be obtained with this method comes from child cognitive development. Specifically, data from the Colorado Adoption Project indicate that strong novel contributions of genetic variance at the level of general ability emerge at the ages of three and seven but seem to be absent during the transition from childhood to adolescence, when genetic variance contributes exclusively to continuity of individual differences.

Estimates of Heritability of Interindividual Differences across the Life Span

Similar to life span changes in stability, heritability in intellectual functioning (e.g., the amount of interindividual variance attributable to genetic differences) increases from about 20% to 50% during childhood and adolescence to about 80% in early and middle adulthood (e.g., McGue, Bouchard, Iacono, & Lykken, 1993). Interestingly, in old age (e.g., beyond age 75), heritability tends to decrease to values around 60% (e.g., McClearn et al., 1997). In contrast, shared environmental influences on interindividual differences generally do not persist beyond the period of common rearing (McGue, Bouchard, et al., 1993). As stated before, these findings are based on samples representing the normal range of environments and genes, and cannot be generalized beyond this normal range (e.g., to extremes of environmental deprivation or reshuffled environments). Within this normal range, however, the life span increase in heritability of interindividual differences is consistent with the notion that adolescents and adults have more of a chance to actively select environments that match their genes than infants and children (Scarr & McCartney, 1983).

Based on the preceding summaries, it appears that relative stability and heritability exhibit similar life span age gradients (see Plomin & Thompson, 1988). More multivariate and longitudinal behavior-genetic evidence is needed to fully understand the covariance dynamics of this life span parallelism. One possibility would be that individual differences in intellectual functioning around middle adulthood are highly stable because the genetic variance component has stabilized at a high level (e.g., not much new genetic variance is added over time), and because environments (which, in part, have been selected on the basis of genetic endowment) also tend to be stable during this period of the life span. Similarly, the breakdown of well-orchestrated genome expression in very old age may cause late-life decrements in level, relative stability, and heritability. Note, however, that selective mortality may counteract the identification of these trends at the population level in very old age (T. Singer, Verhaeghen, et al., 2003).

The Mechanics and Pragmatics in Very Old Age

So far, our discussion of life span intellectual development was organized around topics, rather than age periods. In this last section, we deviate from this practice by giving special attention to the life period of very old age. In our view, this last phase of life merits such attention because it represents a natural boundary condition for the validity of the two-component model of intelligence and cognition. Specifically, we expect that an increasing portion of the very old population eventually attains levels of mechanic functioning that are sufficiently low to impair intellectual functioning in a relatively global manner. A number of recent empirical cross-sectional and longitudinal observations from the BASE (P. B. Baltes & Mayer, 1999; P. B. Baltes, Mayer, Helmchen, & Steinhagen-Thiessen, 1993) support and qualify this prediction (for a detailed summary, see Lövdén et al., 2004). Three results from this very old sample are most pertinent to the two-component model (P. B. Baltes & Lindenberger, 1997; Lindenberger & Baltes, 1995a).

Covariance Dedifferentiation

First, ability intercorrelations both between and within fluid-mechanic and normative-pragmatic domains were of much higher magnitude in old age than corresponding ability intercorrelations during middle and early adulthood. Based on these data, the amount of covariation among interindividual differences in intellectual abilities, or the prominence of *g,* seems to increase in very old age (P. B. Baltes & Lindenberger, 1997). The idea that *g* may vary as a function of age and/or ability level dates back to Spearman (Deary & Pagliari, 1991), and has led to the differentiation/dedifferentiation hypothesis of life span intelligence (Garrett, 1946; Lienert &

Crott, 1964; Reinert, 1970). Despite methodological difficulties in testing this hypothesis (J. R. Nesselroade & Thompson, 1995), the evidence obtained so far seems generally supportive (for a summary, see Lövdén & Lindenberger, 2004). For instance, Li, Lindenberger, et al. (2004) performed life span-comparative exploratory principal component analyses of fifteen intellectual ability tests. The results of these analyses are shown in the lower panel of Figure 11.10. In childhood, late adulthood, and old age, only two components with eigenvalues greater one were extracted, but in adolescence, young, and middle adulthood, five components displayed eigenvalues greater than unity. Also, fluid and crystallized intelligence were more highly correlated in childhood, late adulthood, and old age than in adolescence, young, and middle adulthood.

From the perspective of the two-component model of cognitive development, the decrease of ability intercorrelations during childhood and the increase of intercorrelations in very old age point to age-based changes (i.e., decrements and increments) in the importance of domain-general processing constraints. Cross-sectional data from the BASE (P. B. Baltes & Lindenberger, 1997; Lindenberger & Baltes, 1994) suggest that old-age dedifferentiation transcends the cognitive domain, and also affects sensory functioning (e.g., Ghisletta & Lindenberger, 2005) and sensorimotor functioning (e.g., balance/gait). In line with these correlational findings, recent neurocognitive evidence demonstrates that processing pathways and brain activation patterns are less differentiated in older adults than in young adults (Cabeza et al., 2004; Park et al., 2004).

Directionality Dedifferentiation

The second finding from the BASE concerns the directionality of the age gradients (Lindenberger & Baltes, 1997). In very old age, differences in the directionality of cross-sectional age gradients between mechanic and normative-pragmatic abilities are on the wane. Instead, gradations of negativity have been observed, with perceptual speed showing the strongest and verbal knowledge the weakest negative age relations.

These cross-sectional observations have been corroborated and qualified by longitudinal evidence (T. Singer, Verhaeghen, et al., 2003). Using latent growth curve modeling (see McArdle, Hamagami, Ellias, & Robbins, 1991), T. Singer, Verhaeghen, et al. (2003) compared cross-sectional and longitudinal age gradients under three different data selection conditions: (1) the cross-sectional/longitudinal convergence age gradients for the T4 longitudinal sample ($n = 132$) using all available data points (i.e., T1, T3, and T4 data); these gradients combine cross-sectional and longitudinal information over chronological age (hence convergence); (2) the cross-sectional T1 gradient of the T4 longitudinal sample (i.e., the same sample as before; $n = 132$); here, the T1 cross-sectional age gradient was examined for individuals who survived and participated up to T4; and (3) the cross-sectional T1 gradient of the original T1 sample ($n = 516$). The three age gradients are shown in Figure 11.15.

With respect to both fluid mechanics and crystallized pragmatics, age-associated decrements in cognition were less pronounced for the longitudinal sample at T1 than for the full cross-sectional sample at T1. Specifically, negative gradients prevailed for all four abilities in the full T1 sample but verbal knowledge did not decline significantly in the longitudinal sample. This pattern of age gradients suggests that decline in the fluid mechanics is normative and age-based, whereas decline in verbal knowledge appears to be partially or primarily associated with closeness to death. The third class of age gradients, the longitudinal convergence gradients for the T4 sample, reinforces this impression.

Maintenance of Divergence in Explanatory Correlational Patterns

Given the two preceding findings, one may begin to wonder whether the distinction between the mechanics and the pragmatics of cognition loses all of its empirical foundation in very old age. Figure 11.16 that compares the correlational patterns of perceptual speed, a fluid-mechanic ability, and verbal knowledge, a normative-pragmatic marker, with variables related to individual differences in sociostructural-biographical or biological status suggests that this is not the case.

Without exception, correlations to indicators of biological functioning were more pronounced for perceptual speed (e.g., the mechanics) than for verbal knowledge (e.g., the pragmatics). The reverse was also true: Correlations to sociostructural-biographical markers were more pronounced for verbal knowledge than for perceptual speed. Apparently, then, the mechanic-pragmatic distinction does not dissolve completely in very old age, but is maintained in the guise of divergent relations to biological and cultural systems of influence.

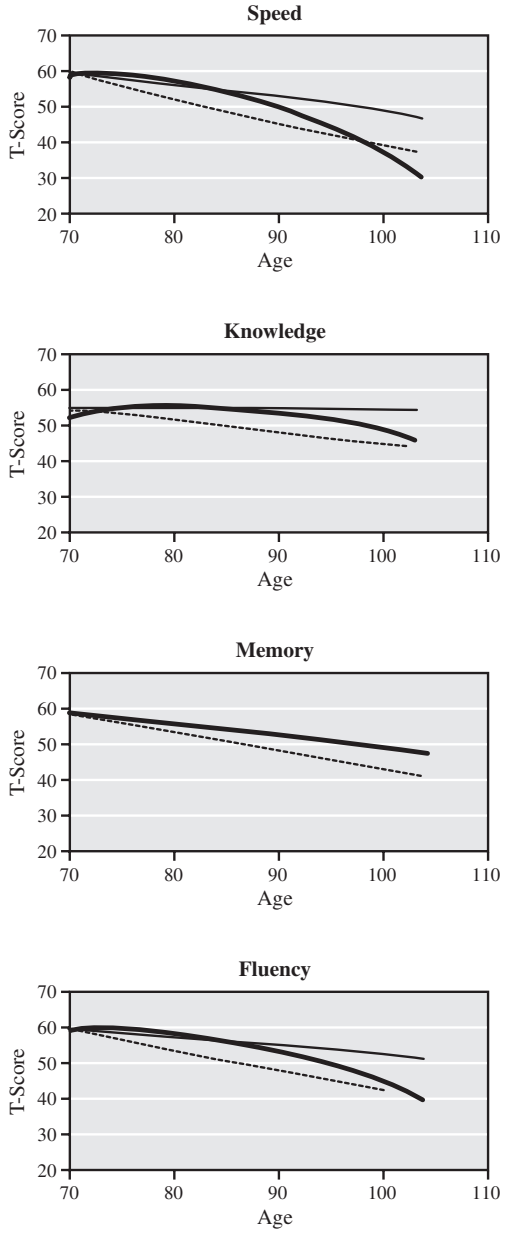


Figure 11.15 Intellectual ability age gradients observed in the Berlin Aging Study as a function of sample and measurement occasion. Thick solid lines represent cross-sectional/longitudinal convergence gradients of the longitudinal sample ($n = 132$), and encompass measurements from T1, T3, and T4, which encompass an average longitudinal observation period of 6 years. Thin solid lines represent cross-sectional gradients of the same longitudinal sample ($n = 132$), and are based on measurements taken at T1. Finally, dashed lines represent cross-sectional gradients for the total T1 sample ($n = 516$). *Source:* From "The Fate of Cognition in Very Old Age: Six-Year Longitudinal Findings in the Berlin Aging Study," by T. Singer, P. Verhaeghen, P. Ghisletta, U. Lindenberger, and P. B. Baltes, 2003, *Psychology and Aging, 18,* pp. 318–331. Copyright © 2003 by the American Psychological Association. Adapted with permission.

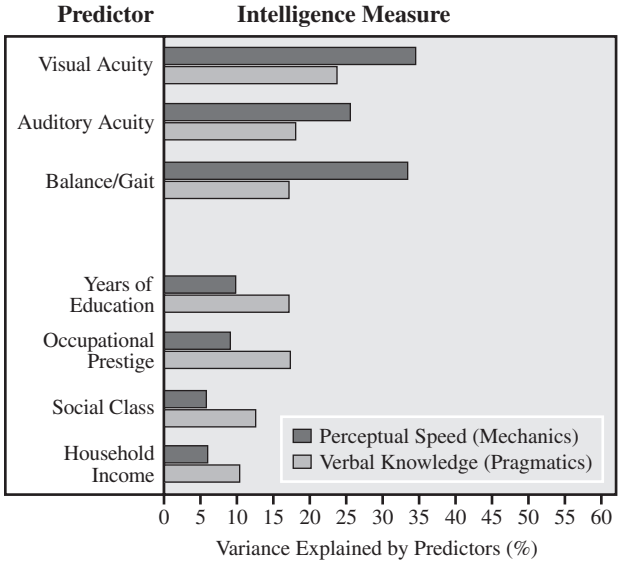


Figure 11.16 The divergent validity of the two-component model of life span intellectual development continues into very old age. The figure displays differential correlational links of perceptual speed, a marker of the fluid mechanics, and verbal knowledge, a marker of the crystallized pragmatics, to indicators of sociostructural-biographical and biological (e.g., sensory) status. Perceptual speed was more highly correlated with biological indicators than verbal knowledge, and verbal knowledge was more highly correlated with sociostructural-biographical indicators than perceptual speed. Thus, despite a general tendency toward dedifferentiation due to age-based losses in the mechanics, the two components of life span cognition continue to show signs of divergent external validity. Data are taken from the Berlin Aging Study ($N = 516$, *age range* = 70–103 years). *Source:* From "The Fate of Congition in Very Old Age: Six-Year Longitudinal Findings in the Berlin Aging Study," by T. Singer, P. Verhaeghen, P. Ghisletta, U. Lindenberger, and P. B. Baltes, 2003, *Psychology and Aging, 18,* pp. 318–331.

LIFE SPAN INTELLECTUAL DEVELOPMENT: CONCLUSIONS

Based on the foregoing (admittedly selective) review of research and theory, we would like to propose the following synopsis of the overall ontogenetic landscape of life span intellectual development.

1. To capture the life span dynamics and biocultural co-construction between biology and culture in the domains of intelligence and cognition (P. B. Baltes, 1987, 1997; P. B. Baltes et al., 1998), we contrasted the mechanics with the pragmatics, and propose a two-component model of intellectual development. This model is inspired by the psychometric theory of fluid and

crystallized intelligence (Cattell, 1971; Horn, 1970, 1989; cf. Tetens, 1777) but calls for a wider range of conceptualization, including evolutionary-psychological, cognitive-experimental, expertise, and neuroscience approaches, to arrive at more valid and comprehensive representations of life span intellectual development. The two-component model accurately predicts a relatively late life span peak followed by maintenance for the knowledge-saturated cognitive pragmatics, and a much earlier life span peak followed by monotonic decline for the cognitive mechanics. It also accurately predicts differential ontogenetic sources of explanation.

2. In terms of mechanisms, age-related changes in information processing rate, working memory capacity, and the inhibition of irrelevant information are among the most prominent candidates for the explanation of life span changes in the mechanics of cognition. At present, these constructs tend to suffer from a lack of formalization, a lack of direct evidence at the physiological level, and from difficulties in making differential predictions. Closer links to the cognitive neurosciences, in particular to chemical, anatomical, and functional life span changes in prefrontal functions, are expected to foster further progress in this area of research.

3. Extant measures of mechanic functioning tend to be contaminated by pragmatic influences. To arrive at more accurate descriptions of life span gradients in the mechanics of cognition, and to move toward explanation in terms of critical components and mechanisms, measurement needs to be purified through the utilization of methods that are better able to assess individuals' upper limits of functioning. As predicted by theory, the use of such methods (e.g., testing-the-limits) results in cleaner separations of individuals from different ages than the use of standard measures (see Figure 11.9).

4. In contrast to the mechanics, the knowledge- and culture-based pragmatics of cognition offer the potential for positive change during adulthood and old age. Within the pragmatic domain, we proposed the distinction between normative and person-specific bodies of knowledge. Normative bodies of knowledge are acquired in the context of general socialization events, such as basic cultural skills and educational curricula, and in general are well amenable to psychometric testing (e.g., vocabulary tests, aptitude tests). Person-specific knowledge refers to specialized knowledge systems that branch off from the normative (average) path, with professional expertise being the most prominent example studied so far. Our suggestion is, and this is based on SOC theory, that highest levels of pragmatic skills in the last third of life carry a strong individualized component.

5. The acquisition of expert levels of knowledge during adulthood may lead to an increasing fragmentation of the intellectual system, but it also may offer the opportunity for acquiring bodies of knowledge with a wide range of applicability, generality, and integration. Wisdom-related knowledge, or knowledge about the meaning and conduct of life, is a prototype. The likelihood of acquiring such domain-general bodies of person-specific knowledge depends on a special coalition of experiential, expertise-specific, and person-related factors (Krampe & Baltes, 2003; Sternberg, 1985).

6. Throughout ontogeny, the pragmatics and mechanics of cognition are intertwined. In everyday life, intellectual functioning and intellectual products represent joint effects of both. For instance, the emergence of domains of pragmatic knowledge builds on, and presumably extends and modifies, evolutionarily predisposed core domains. The mechanisms of this pruning of cultural knowledge onto species-specific architecture await further study. Another example of pragmatic/mechanic interdependence concerns the acquisition and use of pragmatic knowledge to compensate for mechanic decline. In close agreement with our general conception of the overall landscape of life span development, this compensatory function of the pragmatics increases in importance but loses in efficiency with advancing age.

7. The study of plasticity (malleability) of intellectual functioning has been a cornerstone of life span research (P. B. Baltes, 1987). Within the limits provided by the mechanics, which remain to be fully explored, intellectual performance is malleable throughout life. Evidence in support of this contention comes both from the study of long-term environmental change and from cognitive intervention studies. With some exceptions (e.g., dementia of the Alzheimer type), there is room for sizeable plasticity at all ages and for all individuals. However, plasticity decreases with advancing age, reflecting losses in the mechanics of cognition. The resulting bounded openness of life span intellectual development is consistent with the biocultural contextualist framework of life span psychology.

8. The joint consideration of different strands of research reveals a striking congruence between three different life span trajectories: Heritability of interindividual differences, relative stability, and level changes

in the normative pragmatics (e.g., crystallized intelligence). In all three cases, there is an increase from childhood to middle and late adulthood, coupled with indications of decline in very old age. This life span parallelism between the genetic component of interindividual differences, continuity of interindividual differences, and general knowledge is consistent with the notion of gene-environment correlations in behavioral genetics (Scarr & McCartney, 1983), and the notion of niche picking in ethology (Dawkins, 1982). Whether one likes it or not, this parallelism testifies to the existence of a powerful life span synergism between sociostructural and genetic interindividual differentiation, at least within the range of developmental conditions offered by Western industrialized societies.

SECOND LEVEL 5 EXAMPLE: THE STUDY OF PERSONALITY DEVELOPMENT ACROSS THE LIFE SPAN

In the following, we illustrate what life span theory has to offer in organizing and stimulating the study of personality development. To do so, we first introduce three approaches that in our view need to be taken into account when studying personality development: (1) a trait approach, (2) a self-system approach, and (3) a self-regulation approach.[1] These three approaches are usually treated in different literatures, and cross-links are still rare, especially with regard to life span development. In the following, we consider all three approaches whenever using the term personality or personality system.

The levels-of-analysis approach introduced in the beginning of the chapter is used as an integrating framework for presenting research from the three approaches. Thus, theory and evidence available on personality development across the life span are used to illustrate the biology-culture interface and the notion of differential allocation of resources. Furthermore, three of the life span propositions introduced earlier that bear special relevance for personality development across the life span are discussed in more detail. These three issues are stability and change in personality development across the life span, opportunities and constraints of personality development, and the adaptive potential or reserve capacity of personality.

Three Approaches to the Study of Personality Development

Research and theory building in the study of personality have been quite diverse (e.g., Pervin & John, 1999). Yet, three longstanding and overarching concerns can be identified, that is, structure/content, dynamics, and development of personality (Funder, 2001). Historically, these three concerns have been linked with the three approaches to the study of personality mentioned earlier (Staudinger, in press).

Under the *trait approach* to the study of personality, we subsume efforts to characterize individuals in terms of fundamental attributes and behavioral dispositions, a line of research that originated primarily in the psychometric tradition. Research in this area focuses on the identification of the structure of personality, on interindividual differences, and the extent of longitudinal stability (e.g., Costa & McCrae, 1994; Goldberg, 1993). The emergence, maintenance, and transformation of personality structure, and the conditions of constancy and change in interindividual differences clearly are of importance for a life span perspective on personality (Brim & Kagan, 1980). In addition, however, a life span perspective is aimed at discerning the degree to which these personality attributes and behavioral dispositions evince intraindividual change trajectories and intraindividual plasticity (malleability). Such questions are pursued in the exemplary research programs involving scholars such as Block (e.g., 1995), Helson (e.g., Helson & Kwan, 2000), or John Nesselroade (e.g., 2002).

Content and structure have also been of great interest in a *self-system approach* to the study of personality. But the self-system approach has also been very much interested in understanding the dynamics of personality (Markus & Wurf, 1987). Under the heading of the *self-system approach,* we subsume lines of work that characterize individuals as multifaceted dynamic structures of a relatively stable array of self-conceptions (e.g., Baumeister, 1992; Greenwald & Pratkanis, 1984;

[1] Note that selecting "personality" as the overarching term does not entail that we attribute greater importance to the trait approach. In the 1998 edition of the chapter, we had chosen "self and personality" as a label. This, however, seems impractical and is diverting from the goal to integrate the three approaches. Therefore, we would like to suggest using "personality" or "personality system" as the overarching term to denote the field of study comprising all three approaches. This is also in line with early personality theorists such as Allport or Murray who certainly did not link their usage of the term personality exclusively to the trait approach.

Markus & Wurf, 1987). Self-conceptions are not meant to encompass any self-referent attitude but rather are confined to those beliefs or cognitions that constitute important (fundamental) self-components. Whenever the social meaning of such self-referent attitudes is in the foreground, the notion of "identity" rather than self-concept is used (e.g., Waterman & Archer, 1990). Different situations or contexts activate different subsets of this composite structure of self-conceptions or self-schemata. Markus and Wurf (1987) have called this the working self-concept. This view of the self-system as both stable and dynamic fits life span conceptions that emphasize the potential for continuity as well as change as a characteristic feature of transactional adaptation during development.

In contrast to the trait approach to personality that aims at inferring behavioral dispositions "from the outside," research on self-conceptions is often (but not necessarily) related to what J. L. Singer (1984) has called the study of private experience or private personality, and Ryff (1984) has labeled as the study of personality "from the inside." Operationally, however, at least most of the adult research of both traditions, that is, the trait and the self-system approach, rely on self-report. Besides the classics such as Erikson (e.g., 1959) or Bühler (e.g., 1933), research programs around scholars such as Loevinger (e.g., 1976), D. J. Levinson (e.g., 1986), Ryff (e.g., 1991), Whitbourne (e.g., 1987), Dittmann-Kohli (e.g., Dittmann-Kohli, Bode, & Westerhof, 2001), Diehl (e.g., Diehl, Hastings, & Stanton, 2001), and Herzog and Markus (1999) focus on the life span development of the self-concept and of its adaptive qualities.

Focusing on personality dynamics or the processes underlying microgenetic personality change is yet a third approach, the study of self-regulatory processes (Carver & Scheier, 1998). Under the heading of *self-regulatory processes,* we subsume all efforts that are aimed at characterizing the organized abilities and skills a person brings to bear on monitoring behavior and experience. With regard to life span development, it is the regulatory behaviors of promoting growth as well as those of reaching, maintaining, and regaining psychological equilibrium including in a context of age-related loss—in particular one's sense of coherence, continuity, and purpose under conditions of microgenetic and ontogenetic change—that are of particular interest.

A host of constructs discussed in the literature can be subsumed under this heading, such as self-evaluative processes, goal-related processes, coping, control beliefs and self-efficacy, or emotion-regulation. The focus of such research is on investigating the self-related adaptive potential and the reserve capacities as well as their limits in the course of life span development. Because this field encompasses many different constructs, the group of scholars engaging in this type of endeavor is quite large and still growing. Thus, we can only mention a few laboratories in order to illustrate the type of work we include under the heading of self-regulatory processes from a life span perspective, such as the ones instigated by Brandtstädter (e.g., 1998; Brandtstädter & Rothermund, 2003; Greve & Wentura, 2003), Cantor (e.g., Cantor & Fleeson, 1994), Carstensen (e.g., Carstensen et al., 1999), Filipp (e.g., 1996), Labouvie-Vief, (e.g., Labouvie-Vief et al., 2003), Lachman (e.g., Lachman & Weaver, 1998), and Blanchard-Fields (e.g., 1996). Other examples are the theory of selective optimization with compensation (e.g., P. B. Baltes & Baltes, 1990a; Freund & Baltes, 2002b) and the related endeavor by Heckhausen and Schulz (1995) to construct a life span theory of self-based developmental control.

A number of recent efforts have been made to integrate these rather disconnected fields of research (e.g., Cloninger, 2003; Hooker, 2002; McAdams, 1996; McCrae et al., 2000). The life span focus in these integrative efforts clearly is on relating structure, content and process-related dynamics such that both stability and change characterize personality development during adulthood (e.g., Roberts & Caspi, 2003; Staudinger & Pasupathi, 2000). In the following section, we not only present relevant information, but also attempt to integrate the three approaches to the study of personality within a life span perspective. As we attempt this integration, a necessary by-product is that we may occasionally transform the foci that were at the core of the work of the original proponents.

Key Features of a Life Span Approach to the Study of Personality Development

We define personality to denote *the ways in which human beings behave/act, experience, believe, and feel with regard to themselves, others, and the material world.* With regard to the sources and outcomes of human development, personality has *multiple causes and functions* (cf. principles of multicausality and multifunctionality). First, personality develops, that is, it is the outcome of developmental processes. Different pathways can lead to similar if not the same outcome. Second, personality also operates as an antecedent for

developmental processes and co-regulates outcomes. And finally, personality is the correlate of other developmental processes.

Taking a life span view implies (a) that we are concerned with the *commonalities* across individuals in how personality develops. This is reflected in developmental models like the one presented by Erikson (e.g., 1959) but also in theories about the driving forces and the mechanisms of personality development (e.g., Bandura, 1984; R. W. White, 1959). At the same time, as life span developmentalists we are interested in (b) the *interindividual differences* in personality development. For instance, do developmental trajectories become less and less similar as transactions between a given personality make-up and particular environmental conditions accumulate across the life span? Finally, we want to learn about (c) the *intraindividual variability or plasticity* in the ways an individual behaves/acts, experiences, believes, and feels about him/herself, others, and the material world. Is it possible, for example, that an extraverted person under certain circumstances behaves more like an introvert? In extreme cases this plasticity can also result in system lability and lack of coherence. Do these plasticity-related phenomena increase or decrease with age, or do they remain unchanged?

These three questions of commonalities, interindividual differences, and of intraindividual variability (plasticity) can be pursued within a *structural* and a *process-oriented* approach to the study of personality and its development. Under the heading of form or structure, it is primarily the classic personality dispositions and the self-conceptions, schemata, or images that are considered. Under the heading of process research, self-regulatory mechanisms are most prominent. At least five categories can be distinguished within that category: emotion regulation, control beliefs, coping, self-evaluation, and the goal system (goal seeking, goal pursuit, goal restructuring).

Finally, all three facets of structure, process, and function can be approached from a *componential* (multivariate) and a *holistic* (ipsative) view. The componential approach is illustrated by evidence on the Big Five personality factors (e.g., Costa & McCrae, 1994; Goldberg, 1993). Block's ipsative approach to personality assessment (e.g., Block, 1995) is an inspiring example of the holistic approach as is the conceptual and empirical work by Magnusson (e.g., Magnusson & Mahoney, 2003). Taking a typological approach to the study of personality development, for instance, by using cluster analysis can also be subsumed under that rubric (e.g., P. B. Baltes & Smith, 2003). Like Magnusson, John Nesselroade, and others, we suggest that life span work on personality development profits from integrating a componential and a holistic approach.

The Search for General-Purpose Mechanisms in the Area of Personality Development

Throughout this chapter, we have emphasized the significance in life span work of the search for the conditions of successful (adaptive) development. From the field of cognitive psychology, we have taken the idea of general-purpose mechanisms. Thus, we ask whether in the field of personality as well it is possible to articulate *general-purpose mechanisms*. With general-purpose mechanisms, we mean (internal and external) resources and capacities that individuals employ to master developmental challenges in a variety of contexts and at different stages of developmental time. General-purpose mechanisms in the field of personality might help the individual to organize and coordinate the ways in which he or she behaves, experiences, believes, and feels with regard to him/herself, others, and the material world such that the goal of maximizing gains and of minimizing losses is approached. In our own work, the theory of selective optimization with compensation (e.g., P. B. Baltes, 1997) is one such general-purpose mechanism; located at a high level of aggregation.

There seems to be a foundation of research on which to build when exploring the notion of general-purpose mechanisms. Empirical evidence, especially when focusing on longitudinal studies that search for predictors of adaptive developmental outcomes, has identified a number of candidate concepts. Impulse control or ego control, perceived control, delay of gratification and ego resilience/flexibility, for instance, suggest to us that they might possess the characteristics of such general-purpose mechanisms in the personality domain (e.g., Bandura, 1993; Block, 1993; Caspi, 1998; Masten, 2001; Mischel, Shoda, & Rodriguez, 1989; Rutter & Rutter, 1993; E. E. Werner, 1995). As is true in cognitive psychology, such general-purpose mechanisms will not function by themselves. Rather, they are part of a system of personality characteristics and self-regulatory mechanisms that are functional or adaptive only under specific circumstances.

One reason why we chose to explore the power of the notion of general-purpose mechanisms is the relative openness of human development (Maciel, Heckhausen, & Baltes, 1994). From a life span point of view, there is no single endpoint of development of any facet of self and personality. The challenge is to coordinate resources under varying conditions. Thus,

there seems to be theoretical and empirical grounds for the assumption that personality functioning is efficacious if (a) many different ways of being are available (e.g., being internally as well as externally controlled, being optimistic as well as pessimistic, being introverted as well as extraverted) and if (b) adaptive algorithms that monitor the dialectic between such supposedly antagonistic states are accessible (e.g., Blanchard-Fields & Norris, 1994; Colvin & Block, 1994; Staudinger, 1999b). By means of such algorithms the most functional personality characteristic for a given time, place, and circumstance is exhibited. This restates in different terms what has been characterized as a wise person (e.g., Staudinger, 1999a; Sternberg, 1998). The approach is also similar to the notion of fluid intelligence in the domain of intellectual functioning (see previous discussion). It is a special characteristic of that category of the intellect that in the sense of a general-purpose mechanism it can be applied to (invested into) a large variety of cognition problems (Cattell, 1971).

The Executive Function of Personality

Life span theory further suggests a *systemic view* on psychological phenomena. This systemic view has at least two consequences for the way we think about personality (Staudinger, 1999b). First, we believe that the different components of personality, introduced earlier, *together* form the personality system. Dynamic systems theory postulates that, by means of recursive interactions, such components form the basis of self-organization as well as the emergence and stabilization of new forms (e.g., Ford & Lerner, 1992; Thelen & Smith, 1998). Second, the systemic view directs our attention also to the cross-linkages between personality and other subsystems of the developing individual, such as physiological and cognitive functioning (e.g., Mischel, 2004; Pervin, 2001). As mentioned already, it seems that personality has something like an *orchestrating or executive function* with regard to these other systems and the developmental changes occurring in these systems (e.g., Erikson, 1959; Waterman & Archer, 1990). Besides the (dynamics) systems approach to the study of personality, the psychology of action has been suggested as a unifying framework for the microgenetic study of the interplay of cognition, emotion, and motivation (Gollwitzer & Bargh, 1996). The extension of action psychology to issues of life span development has begun to be explored (e.g., Brandtstädter, 1998; Brandtstädter & Rothermund, 2003). There is first evidence accruing that the developmental model of selective optimization with compensation, introduced previously, also holds promise in this respect (e.g., Freund & Baltes, 2002b).

Third, and finally, personality develops to serve a self-reflective function. Personality reflects and evaluates developmental changes in the other subsystems and tries to integrate them. This integrative and adaptive function of personality is also mirrored in the fact that subjective measures of adaptation such as subjective well-being or happiness are even used as measures of self (e.g., Bengtson, Reedy, & Gordon, 1985). Self-reflection is pivotal with regard to evaluating one's standing in the developmental matrix of possible life goals and outcomes (e.g., Staudinger, 2001).

Providing Links from Infancy to Old Age

A further issue with regard to a life span perspective on the study of personality development concerns encompassing the ontogenetic course from *infancy* to *old age*. Empirically and theoretically, this distance may often still appear as a gap. Infancy and childhood research on the one hand and adulthood and old-age research on the other typically proceed independently from each other with little overlap in concepts, methodology, and consequently empirical data basis. Although much progress has been made, especially by longitudinal researchers whose participants have grown into adulthood (Pulkkinen & Caspi, 2002), the caveats expressed in the past continue to exist: For example: Which measures are age-invariant? How to capture explanatory continuity when combined with descriptive discontinuity?

Bridging this gap and establishing connections indeed is not easy (e.g., Brim & Kagan, 1980). It seems necessary to identify constructs that have been used to describe personality development across the life span or have at least shown predictive relationships. This concerns the question of homotypic and heterotypic continuity, a terminology introduced by Kagan and Moss (1962), or of Block's notion of temporal coherence (e.g., Block, 1993). The notion of heterotypic continuity implies that the phenotypic behavior might change between childhood and adulthood, but that specific behaviors in childhood might still be conceptually consistent with adult behaviors. Phenotypically different but conceptually related responses might be derivatives of earlier behavior (e.g., Moss & Sussman, 1980). R. G. Ryder (1967), for example, found that childhood task persistence was related to adult achievement orientation.

There are a number of interesting candidates that serve as examples of constructs that span a lifetime, such as attachment style, control beliefs, the self-concept, or temperament. For temperamental features, for instance, extensive longitudinal evidence is available that has demonstrated quite strong predictive links between temperament in early infancy and personality in adulthood and even old age. In this work, five temperamental features are distinguished, activity level, positive affect, negative affect, avoidance/approach, persistence. Longitudinal relations show that, for instance, activity level is related to extraversion and lower levels of conscientiousness or negative affectivity predicts neuroticism and lower levels of agreeableness (e.g., Caspi, 1998; Friedman et al., 1995; Kagan & Snidman, 1991; J. V. Lerner & Lerner, 1983). These kinds of predictive relationships, however, should not be interpreted as a deterministic argument. Rather, work by Chess and Thomas (1984) and J. V. Lerner and Lerner (1983) demonstrated that depending on the "goodness-of-fit" between the child's temperament and expectations of the environment, temperamental constellations can be aggravated or alleviated.

Recently, there has been notable progress in identifying some of the mechanisms that might link infant temperament and adult personality and that might enable a joint organization of concepts of temperament and personality (e.g., Strelau & Angleitner, 1991; Zuckerman, 1995). Zuckerman (1995), for example, has proposed what he calls the turtle model of personality. In this model, personality traits at the top are linked to genetics at the bottom through (from top down) social behavior, conditioning, physiology, biochemistry, and finally neurology. This model is not meant to be reductionistic; it is necessary to study each level of analysis with its own intellectual agenda to gain a complete understanding. As Zuckerman (1995, p. 331) puts it, "We do not inherit temperamental patterns as such. What is inherited are chemical templates that produce and regulate proteins involved in building the structure of nervous systems and the neurotransmitters, enzymes, and hormones that regulate them. We are born with differences in reactivities of brain structure and differences in regulators." Very much in line with our systemic emphasis, it is included in this multiple levels of analysis model of Zuckerman that the type of temperamental pattern, which initially may have a strong genetic component, attains features of contextually based self-organization. Thus, the temperamental pattern is transformed by context and experience in ways that it becomes an outcome of a multicausal and self-organizing process.

In sum, in this first section we have attempted to engage the reader in an integrative view on research on the development of personality, self-concepts, and self-regulatory processes. In order to gain an understanding of the life span development of self and personality, it seems useful to consider structure and processes, as well as functions (Mischel & Shoda, 1999). A dynamic systems approach to development provides a useful theoretical framework for the integration of the different components of personality discussed in the literature. In addition, interest of a life span perspective centers on features—such as temperament—that allow to study continuity and discontinuity across the whole life span and also demonstrate predictive power from childhood into adulthood. Based on this conceptualization, we will now apply the level of analysis approach, introduced in the beginning of this chapter, to the field of self and personality.

Illustrations of the Role of Biology and Culture in Personality Development

How does Figure 11.1 apply to the field of personality? Working from the assumption that the genome and its expressions, by means of evolution, are not optimized with regard to old age, and that genetic programs potentially are less orderly and integrated for late than for young adulthood (e.g., Kirkwood, 2003), what are the implications for personality functioning across the life span? Recently, there has been growing interest in explicating the evolutionary base of personality, both in terms of biological and cultural-social forces in the sense of co-evolution (e.g., Barkow, Cosmides, & Tooby, 1992; Klix, 1993). This trend, however, is only beginning to reach the second half of life (e.g., Plomin & Caspi, 1999).

As selection primarily operates through fertility and parenting behavior, most of the evolutionary work in the field of personality (in the widest sense) has focused on gender differences in altruism, cooperative behaviors, sexual competition, or jealousy (e.g., DeKay & Buss, 1992; Hammerstein, 1996). In addition, however, arguments have been raised that the ability for self-deception might have been favored by evolution because it seems to increase the ability to deceive others and thereby gain a survival advantage (e.g., Gigerenzer, 1996; Trivers, 1985). The evolutionary importance of

the ability to deceive others in turn is related to the crucial role of reciprocal relationships for reproductive fitness (e.g., Axelrod, 1984). We would like to suggest that this ability "to deceive oneself," or one could also say "redefine reality," indeed serves an important adaptive function across the life span and probably increasingly so in old age.

Thus, the fact that the evolutionary base has been less "optimized" for the postreproductive phases of life than for younger ages may not be as detrimental for the ontogenesis of self and personality as for biological and cognitive functioning. Perhaps what is relevant here is that the "mechanics of the mind" which evince definite aging losses (see earlier discussion), either carry little implication for personality functioning, or that evolutionary selection in humans provided a better basis for personality than for intellectual functioning.

This interpretation of findings from evolutionary psychology, that personality is less at a disadvantage than cognition and biological functioning, is supported by findings on the genetic component of interindividual differences in personality functioning as advanced by behavior-genetic research. Evidence from the cross-sectional as well longitudinal analyses of the genotype and the phenotype of personality characteristics indicate that none of the personality traits is without a 40% to 50% genetic variance component. There are still too few data sets, however, that would allow disentangling methods effects. Mostly twin and adoption studies have used self-report data to assess personality. When comparing genetic variance components as derived from self-report with those based on peer ratings clear differences emerge that suggest that observational assessment and/or test-based assessment of personality may still yield other results. Based on the few data sets that allow for multimethod testing it seems that genetic factors largely account for what is in common across assessment methods (Plomin & Caspi, 1999). Across the life span, genetic variance components seem to follow a different pattern than the one just reported for the domain of intellectual functioning. During the life course, stability or even slight *de*creases in heritability coefficients have been found (e.g., Pedersen & Reynolds, 2002).

This very general summary statement needs qualification and differentiation. So far, only few behavior-genetic studies of personality based on longitudinal data with extensive age intervals are available, let alone using multiple assessment techniques. Highly complex statistical methods that allow modeling of the genetic architecture of development (Pedersen, 1991) by simultaneously taking into account mean levels and growth curves (e.g., McArdle & Bell, 1999; J. R. Nesselroade & Ghisletta, 2003) have become available. However, due to the lack of appropriate data sets and to the recency of their availability, they have not been widely applied yet. Therefore, authors in the field of behavioral genetics consider the available evidence as preliminary (e.g., Pedersen & Reynolds, 2002).

Taking such limitations into account, the following preliminary insights into the developmental behavioral genetics of personality seem to find consensus among behavioral geneticists (e.g., Pedersen & Reynolds, 2002). First, results of behavior-genetic analyses of personality assessments are difficult to compare with the equivalent analyses of intelligence assessments because the latter are based on behavioral performance measures, whereas personality measures typically refer to self-reports. Thus, strictly speaking, personality-related analyses refer to the heritability and its life span changes in how people report about themselves. Second, the extent to which genetic influences account for phenotypic variability in personality measures is smaller than for measures of intelligence, with heritability coefficients between .4 and .6 depending on the personality trait and the age of assessment. Third, the importance of genetic influences on interindividual differences in personality seems to decrease slightly with increasing age (e.g., McGue, Bacon, & Lykken, 1993; Pedersen & Reynolds, 2002). And fourth, there is initial evidence for a quite high overlap in the genetic effects (i.e., stability) operating on personality expression at different ages, although at each point in time they account for not more than half of the variance (e.g., McGue, Bacon, et al., 1993; Pedersen & Reynolds, 2002).

One of the more recent and exciting directions for genetic research on personality involves the use of molecular genetic techniques to identify some of the specific genes responsible for genetic influences on personality (Hamer & Copeland, 1998). It is too early to be certain, but it is possible that ultimately this molecular genetic analysis will become more and more prominent. That it will shift our attention away from focusing on quantifying genetic influences to a focus on the causal mechanisms from cells to social systems that will elucidate how genes affect and are affected by personality development. Currently, progress is

being made with regard to the molecular analysis of temperamental features such as approach/avoidance or positive/negative emotional tone (see the following discussion). In the long run, such molecular genetic analysis may help to answer questions of heterotypic continuity much more clearly than currently is the case when referring to behavioral measures (Plomin & Caspi, 1999).

The Allocation of Resources in Personality Functioning

In an earlier section, we emphasized the life span developmental script of a reallocation of resources, from a predominant allocation into growth to an increase in relative allocation into maintenance, repair, and management of losses (see also Staudinger et al., 1995). In contrast to the domain of cognitive functioning where resources in old age are depleted to maintain a certain level of functioning, the resource situation for life span growth in self and personality might present itself more favorably. Taking a system's view on psychological functioning, we can assume therefore that personality by virtue of being the self-reflective head of the living system "human being" (a quality emerging during childhood) might be able to continue to deliver its orchestrating or executive function with regard to managing the gains and losses across various domains of functioning until at least the third age (cf. Staudinger et al., 1995).

It is less and less certain, however, whether, on average, personality-related resources are available in old age to promote further development of the personality-system itself. In other words, as life reaches old age, it becomes more and more necessary for available personality-related resources to be invested in managing cognitive, physical, and social declines and losses. Possibly only under very favorable developmental conditions would personality-related resources be sufficient to invest in further development of personality itself. Although, in principle, life span changes in personality could include advances, we do not expect them to occur in everyone. Under very favorable conditions, however, personality growth might even involve such high goals as wisdom (cf. Erikson, 1959; see also P. B. Baltes, Smith, & Staudinger, 1992).

Further, we assume that the personality-system also manages and organizes the extension of internal resources (e.g., cognitive capacity, physical strength, personality characteristics) by referring to others and the physical and institutional context as resources (for overview see Staudinger et al., 1995). Others can help to do things that one's own health or time or ability does not allow. External memory aids can help to compensate for the loss in memory performance. Given this line of thought, one can also conceive of a situation that allows personality to optimize the use of external resources such that enough internal resources are left for further personality development, for example, toward wisdom. An extreme case for such personality-based orchestrating of resources aimed at selective optimization is the loss of independent functioning. There the task is to accept dependency in such domains as household management in order to free up resources for other purposes (M. M. Baltes, 1996).

The notion that personality performs an orchestrating or executive function with regard to the management and identification of resources raises the following question: Is it possible to distinguish the mechanisms and characteristics that support the overarching orchestrating or executive functions from those that constitute one of the three domains of psychological functioning, that is intelligence and cognition, self and personality, and social relations, or are both inextricably intertwined? This question is discussed in research on *resilience* (Staudinger et al., 1995). By taking such a research perspective on the origins, maintenance, and consequences of personality—ideally in a longitudinal manner—it becomes possible to identify, for instance, whether, or how, personality manages itself while at the same time having to manage extraordinary challenges such as losses in cognitive functioning or losses of significant others due to death, or to challenges of one's own finitude. Each process and each characteristic constituting personality can thus be identified as a phenomenon in itself but also in its executive and orchestrating function.

We next discuss in more detail three issues of personality development across the life span. The first is the question of stability and change across the life span. Aside from questions of stability in individual rank order, this issue can also be phrased as investigating the gains, maintenance, and losses in mean levels in personality functioning. The second issue relates to the opportunities and constraints of personality development. And finally, the third issue will illustrate the adaptive personality-related potential across the life span, which arguably might present the most comprehensive general-purpose mechanism involved in life span development.

Personality Development as Lifelong Transactional Adaptation: Continuity and Change

Before we explore further the question of continuity and change (gains, losses) in personality development, it seems useful to consider the question what it means to speak about gains and losses in the context of personality functioning. Using the notions of growth and decline or gain and loss with regard to personality characteristics makes the criterion problem of what is a gain and what a loss even more obvious and pressing than it is with regard to intellectual functioning. In cognitive research, it seems obvious that the more words one can remember, the better; the faster we can complete a problem-solving task, the higher the level of performance. But even with regard to intellectual functioning such criteria of adaptive fitness, of what is a gain and what a loss, are subject to contextual conditions. When it comes to personality, we are presented with the problem of determining a "best" direction of personality development. What is the desirable end state of personality development? Is there one, or are there many potentially incompatible ends depending on the outcome criteria we examine? To what degree do subjective and objective criteria converge?

For example, let us take extraversion and assume that being extraverted is set as an aspired goal of personality development. We can think of occasions, however, when, on the contrary, introversion turns out to be the more adaptive personality feature. Similarly, it is very important to strike a balance between affiliation and solitude or between autonomy and dependence. Such considerations remind us of the argument presented previously about general-purpose mechanisms. We argued there that it is the flexibility and the availability of a monitoring algorithm that is "best" with regard to self and personality functioning, rather than one or the other personality characteristic (e.g., Aspinwall & Staudinger, 2003; Staudinger, 1999b). Similar views can be applied to coping research. There, high domain-specificity with regard to the functionality of coping behaviors has been identified. Furthermore, coping behaviors that are adaptive as immediate responses need not be adaptive in the long run. Thus, even with regard to coping, implications for everyday functioning are not fully known (Filipp & Klauer, 1991).

One approach to deal with the question of functionality is to invoke subjective assessments, for instance, about the perceived desirability or undesirability of a given self-related attribute. In a series of studies on beliefs and expectations about development, Heckhausen and Baltes found that people have quite clear conceptions about what they consider to be a desirable and what an undesirable developmental outcome and also when it is supposed to occur. For example, only two desirable personality characteristics were reported to continue to grow in old age, that is wisdom and dignity, whereas many other positive characteristics were mentioned as emerging for the periods of young and middle adulthood (Heckhausen, Dixon, & Baltes, 1989). It was also found in these studies that people of different ages and socioeconomic backgrounds agree about how personality develops and about what is a desirable and what an undesirable personality development, that is, what is a gain or a loss.

In the following, as we characterize gains and losses in life span development of self and personality, we use two approaches (see also Staudinger & Kunzmann, 2005). A first is based on evaluating developmental changes with regard to the adaptivity and functionality of the outcome for the individual, be it from a subjective (e.g., subjective well-being) or an objective perspective (e.g., longevity). The second refers to theoretical growth models of personality (e.g., ego maturity, integrity, generativity) when making a judgment about gains and losses. We alert the reader to the problem that these categorizations are preliminary and by no means absolute.

Be it gains or losses, it is the core assumption of a life span perspective that personality does not simply passively unfold as a consequence of the prewired maturational programs or the mechanistic reaction to environmental stimuli. Personality develops out of a constant and active process of the individual's transactions with changing internal and external influences, including biological changes and changes in historical conditions of society. "Transactional adaptation" (e.g., R. M. Lerner, 1984, 2002) or person-environment interaction (e.g., Magnusson, 1990; Magnusson & Stattin, Chapter 8, this *Handbook,* this volume) are considered the central developmental processes. In this process of transactional adaptation of personality, systemic principles of self-organization are key ingredients. This basic life span premise about personality development is further elaborated by the differentiation between the mechanics and pragmatics of life and how it pertains to our understanding of personality development.

The Mechanics and Pragmatics of Life as Relevant to Personality Functioning

As described earlier the contribution of the mechanics and pragmatics as well as their dynamic interaction is quite well understood with regard to cognitive develop-

ment (see also P. B. Baltes et al., 2006; Cabeza, 2002). With regard to personality, however, we are still at the beginning of understanding the interaction between mechanic and pragmatic elements in producing developmental trajectories. The developmental trajectories of the cognitive mechanics and pragmatics are well established at least in terms of the behavioral level. We also know that with increasing age the cognitive pragmatics help to compensate functional deficits in the mechanics (e.g., Salthouse, 1984; see also P. B. Baltes et al., 1998; Staudinger et al., 1995). Do we expect to see similar developmental trends when investigating the mechanics and pragmatics as relevant to personality functioning?

It may be useful to extend the notion of cognitive mechanics and pragmatics to encompass personality functioning. Thus, instead of speaking of cognitive mechanics and pragmatics one may consider to use the more general notion of mechanics and pragmatics of life (see also Staudinger & Pasupathi, 2000). Clearly, this model is of a heuristic nature; that is, we do not assume that any phenomenon in the area of personality can be assigned to *only* representing the mechanics or the pragmatics. Rather, we assume that it may be useful to categorize aspects of personality functioning according to their relative position on the continuum between the mechanics and pragmatics of life. In the following, these more general notions of mechanics and pragmatics are explicated with regard to their relevance for personality functioning and development.

The Mechanics of Life as Relevant to Personality Functioning. The life mechanics relevant to personality functioning refer to a unique configuration of elements that contribute to interindividual differences in self-concept, self-regulation, or trait personality such as basic emotional and motivational tendencies as they are studied in temperament research (positive/negative emotional tone, approach/avoidance, novelty seeking; Schindler & Staudinger, 2005a; Staudinger & Pasupathi, 2000). This configuration entails basic emotional and motivational tendencies, as well as cognitive processes that can be observed on the behavioral as well as on the neurophysiological level.

The mechanics of life encompass complex interactions between the cellular, neural, endocrine, and immunological system, which in turn provide the basis for basic behavioral indicators of cognition, emotion, motivation, and behavior/action. On the behavioral level basic temperamental features such as emotional, motor and attentional reactivity as well as their regulation are considered (e.g., Rothbart, 2001). On the level of physiological indicators, it is impossible to clearly separate from each other aspects of the mechanics that underlie either cognition, or emotion, or motivation. For instance, changes in heart rate such as acceleration can be observed during negative affective episodes, but also during mental arithmetic (cf. Baltissen, 2005; Levenson, 2000). With regard to neuroanatomy, there is evidence for specialized brain areas (e.g., the amygdala, prefrontal cortex) that contribute to the formation of both basic emotions and basic motivational tendencies but not to higher cognitive functioning (e.g., Davidson, Jackson, & Kalin, 2000). A further differentiation between emotion and motivation, however, so far seems not possible. The emotion of fear, for instance, is inextricably linked to avoidance motivation. Temperamental dimensions also tend to show substantial interrelations, reflecting an underlying affective-motivational system rather than separate qualities (cf. Rothbart & Bates, 1998).

The Pragmatics of Life as Relevant to Personality Functioning. The pragmatics of life as they are relevant to personality functioning represent the power of experiences and contextual influences. They encompass self-related knowledge as well as self-regulatory competencies (Staudinger & Pasupathi, 2000). Knowledge about the self pertains to trait conceptions of personality as well as to the self-concept. It includes all that we know about our behavior, past experiences, anticipated and idealized futures, needs and wishes, abilities, or weaknesses that characterize our selves. The concept of who we are and what we are like is closely related to how we pursue goals, evaluate our selves or adjust our self-views or goals under threat. Thus, self-regulation constitutes the procedural part of our self-knowledge.

The Dynamic Interaction of the Mechanics and Pragmatics of Life as Relevant to Personality Functioning. The mechanics and pragmatics of life mutually influence each other. As mentioned previously, we follow Cattell's (e.g., 1971) investment theory and consider the life mechanics as the building blocks promoting developmental progress in the life pragmatics (Staudinger & Pasupathi, 2000). At first sight, it seems that the mechanics constrain the pragmatics, and to a certain degree that is true. But most genetic as well as recent brain research has demonstrated that, for instance, the richness or poverty of the (factual and procedural) knowledge we accumulate feeds back into the life mechanics and indeed may even change them (genetic

expression, brain structures; Kirkwood, 2003; W. Singer, 2003; see also S.-C. Li, 2003). Extremely inhibited children, for instance, are able to gain control of their fearful behavior, changing not only their psychological state but also the underlying reactive sympathetic nervous system (Kagan, 1998). This reciprocal interaction of mechanics and pragmatics highlights the limits of the hardware-software metaphor introduced earlier (at least as our current understanding of hardware is concerned).

The life span conception of ontogenesis (e.g., P. B. Baltes et al., 1998; Brandtstädter, 1998) as a product of the interaction between biology (i.e., life mechanics), culture, and automated as well as purposeful attempts at regulating one's development (i.e., life pragmatics) implies that it is impossible to clearly separate the mechanics from the pragmatics of life. Starting at conception, biology, culture, and the developing "person" interact. We just showed that, for instance, basic temperamental dimensions (i.e., mechanics) and personality characteristics (i.e., pragmatics) show predictive relations across the life span (e.g., Caspi & Silva, 1995). But we do not know yet how exactly the underlying mechanics play out in the development of traits. For instance, do changes in the life mechanics result in the age-related decrease in openness to experience (e.g., decay in the physiological basis of the approach system, or reduced biological resources "demand" parsimonious; i.e., habituated, rather than novel functioning) or is it rather the result of years of experience (e.g., losing interest because I have seen it all before), that is, the life pragmatics? Or is it both? Despite the seemingly inextricable interaction, it may nevertheless be useful for heuristic purposes to distinguish between the life mechanics and pragmatics of personality and use this distinction to better understand personality development across the life span. We start by reviewing some first and still scarce evidence on the life span development of the mechanics followed by results with regard to the life pragmatics of personality.

The Development of Neurophysiological Indicators of Life Mechanics of Personality

When we consider the mechanics of life it is not trivial to identify indicators that have a clear emphasis on the mechanic side and that at the same time can be used to assess participants across the whole life span. Especially on the behavioral level, such as basic behavioral indicators of temperament are usually not applied throughout the life span but are substituted by personality trait measures when adults are assessed. In our terminology, however, trait measures of personality are the result of many cumulative interactions between the biological basis of personality, context and individual choices. Thus, they are much closer to the pragmatic than the mechanic end of the continuum.

Behavioral operationalizations of basic temperament dimensions clearly are closer to the mechanic end of the continuum even though we need to be aware that the pragmatic component gains importance whenever self-report is involved (cf. P. B. Baltes et al., 1998; Kagan, 1998). Nevertheless, with regard to affective tone it is possible to consult basic behavioral findings from life span emotion research. Also, there is some scarce behavioral evidence on the approach/avoidance system stemming from research on the goal system.

In addition, one can have a look at neurophysiological indicators of personality functioning in order to learn about the development of the mechanics of life. Two neurophysiological indicators have been—reliably and across different laboratories—identified as biological indicators of basic dimensions of affectivity and motivation: (1) autonomic reactivity and (2) cerebral asymmetry (see also Schindler & Staudinger, 2005a). Those two indicators seem to be rather "pure" reflections of the life mechanics given presently available measurement paradigms and they have received most of the empirical attention.[2] In the following, we will first present developmental evidence for the two neurophysiological indicators. Subsequently, progressing from the mechanics a little further toward the pragmatics end of the dimension, we present developmental evidence on the behavioral data about emotional tone and about the approach/avoidance tendency.

Autonomic reactivity (heart rate, heart rate variability). The parasympathetic and sympathetic branches of the autonomic nervous system influence the activity of the heart. Both higher sympathetic reactivity (e.g., Kagan, 1998) and a weaker influence of the parasympathetic nervous system (e.g., Porges & Doussard-Roosevelt, 1997) have been linked to behavioral inhibition (i.e., withdrawal/avoidance). Our focus is on the relationship

[2] These two indicators only present a subset of the physiological indicators of temperament and additional indicators that may be discussed in this context are excitability levels of the amygdala, asymmetric activation of the amygdala, norepinephrine, cortisol, or dopamine levels (e.g., Davidson et al., 2000; Depue & Collins, 1999; Kagan, 1998; Rothbart & Baltes, 1998).

between heart rate and heart rate variability on the one and basic dispositions such as approach/avoidance or positive/negative emotional tone on the other hand.

On the one hand, a low and variable resting heart rate is generally related to approach behavior and positive affect, but also to regulatory disorders and angry irritable affect (e.g., Porges & Doussard-Roosevelt, 1997; Rothbart & Bates, 1998). These two findings seem contradictory, but match the special nature of anger. Albeit considered a negative affective state, anger is associated with a motivation to approach rather than to avoid or withdraw (e.g., Davidson et al., 2000; Harmon-Jones & Allen, 1998). On the other hand, higher resting heart rate combined with lower variability and high reactivity shows relations to inhibitory or avoidance behaviors (e.g., Kagan, 1998). These findings highlight the necessity to consider the regulation of the heart rate in response to stimulation in addition to the resting heart rate. Indeed, it is the physiological regulation of cardiac activity that has been suggested as "an antecedent substrate for emotional, cognitive, and behavioral regulation" (Doussard-Roosevelt, McClenny, & Porges, 2001, p. 58). Infants who have a low and variable resting heart rate *and* demonstrate appropriate heart rate modulation tend to show more optimal developmental outcomes (at age 3) such as fewer depressive and aggressive behaviors and more socially competent behaviors (e.g., Porges & Doussard-Roosevelt, 1997).

During childhood stability of resting and stress-tested heart rate as well as its variability reach close to perfect levels (Porges, Doussard-Roosevelt, Portales, & Suess, 1994). Mean-level decreases in resting heart rate and increased levels of variability have been observed between 9 months and 3 years of age (Porges et al., 1994). Unfortunately, no studies investigating mean-level stability of heart rate and its variability from childhood into adulthood and old age are yet available. But there is evidence that the resting heart rates of older adults hardly differ from those of young adults, while maximum heart rate is considerably reduced with increasing age (Folkow & Svanborg, 1993). Heart rate reactivity is also attenuated in older adults (e.g., Levenson, Carstensen, Friesen, & Ekman, 1991; see Baltissen, 2005, for an overview). In addition, once the ANS is activated, there is at least some first indication from emotion research that the activation tends to persist for longer time periods in old compared with younger adults (Levenson et al., 1991). To date, however, no data exist about possible changes of the relation between autonomic reactivity and behavioral indicators of approach/avoidance or other personality indicators across the life span.

Cerebral Asymmetry. Over the last 15 years different laboratories have developed theories and accumulated empirical evidence concerning the idea that approach (Gray, 1981), activation (Cloninger, 1987), and engagement (Depue, Krauss, & Spoont, 1987) motivation on the one hand, and avoidance, withdrawal (Davidson, 1984), and inhibition (Cloninger, 1987; Gray, 1981) motivation on the other hand are related to different neural substrates, different basic emotions, and have distinct influences on action. The approach/engagement system facilitates appetitive behavior, generates particular types of approach-related positive affect, and is related to relative increases in left-sided prefrontal activation. There is some evidence that dopaminergic pathways play a central role in that system (e.g., Depue & Collins, 1999). The withdrawal/inhibition system, in contrast, responds to threats or signals of punishment. Its engagement inhibits ongoing behavior (Gray, 1981) or supports withdrawal behavior (Davidson, 1984) and involves negative affective states such as anxiety, disgust, and heightened vigilance. The activation of the inhibition/withdrawal system is associated with relatively stronger activation of the right prefrontal cortex.

Interindividual differences in baseline prefrontal activation asymmetry are related to differences in dispositional affect, inhibition, and differential reactivity to negative stimulation (Davidson et al., 2000). For instance, infants with higher relative right anterior cortical activation at baseline are more likely to cry in response to being separated from their mothers compared to infants that do not show that asymmetrical activation pattern. Children with asymmetric right-sided anterior activation show a tendency toward inhibited behavior. During adulthood, greater relative activation of the right anterior cortex at rest has been related to higher levels of general negative affect, higher self-reported behavioral inhibition, stronger negative affect in response to unpleasant film clips, and slower recovery following a negative affective stimulus (for an overview see Davidson et al., 2000).

Although there is evidence of internal consistency and test-retest reliability of measures of prefrontal asymmetry (Tomarken, Davidson, Wheeler, & Kinney, 1992), our knowledge about the intraindividual development of cerebral asymmetry especially over longer time spans is

still very limited. Rank-order stability of baseline prefrontal asymmetries seems to be very low over an 8-year period during childhood (Davidson & Rickman, 1999), but stability is assumed to increase after puberty when the prefrontal cortex has stopped to undergo developmental change (Davidson et al., 2000).

Again, there is no study yet that compares the relative magnitude of prefrontal asymmetry between infants, children, and adults. Cerebral asymmetry has been demonstrated during the 1st year of life (cf. Davidson et al., 2000), but it is unclear whether these interindividual differences in brain activity stay stable during further development. It has been speculated that the later development of left-brain abilities might be accompanied by a maturational shift toward better emotion-regulation (see Rothbart & Bates, 1998). Similar to research on heart rate and its variability, there seems to be hardly any evidence on the mean-level stability of prefrontal asymmetry in old age. We only found one study of odor perception in older adults that showed that left frontal brain activation in response to pleasant stimuli was uncompromised. However, brain activity in response to unpleasant stimuli did not differ from that to neutral stimuli (Kline, Blackhart, Woodward, Williams, & Schwartz, 2000). This may imply that the right prefrontal cortex area undergoes stronger age-related losses in functioning than the left prefrontal area. We will see in the next section that on a behavioral level of assessment there is evidence accruing for differentially reduced frequency of negative emotions as well as reduced reactivity to negative stimuli.

Some Conclusions about the Development of Neurophysiological Indicators of the Mechanics of Personality Functioning. To date, there are few studies on either mean-level or rank-order stability of the selected physiological indicators of the life mechanics of personality and the majority of extant findings come from studies on infancy and childhood. Thus, we can only draw some very preliminary conclusions about life span development. Substantial stability coefficients are attained past adolescence. Thus, these physiological indicators may possibly contribute to continuity on the behavioral level. The mechanics underlying basic motivational and emotional tendencies show smaller mean-level changes than the cognitive mechanics across the life span. But there are some decreases such as the declining physiological reactivity of the ANS in old age and the possibly reduced asymmetry in prefrontal brain activation. Please, note that these changes in the mechanics by no means have to play out as losses on the behavioral level but rather—as discussed next—the opposite may be the case.

Overall, our understanding of life span changes in the life mechanics of personality as well as their relation with behavioral indicators is still limited. We need studies linking differential age-related change in physiological indicators to differential intraindividual change in personality. For instance, what happens to inhibited individuals who have a tendency to show strong heart rate acceleration in response to challenge when they reach old age? We know that heart rate acceleration probably declines with increasing age due to reduced reactivity of the ANS. But is there any age-related change in behavioral inhibition as a result of declined heart rate reactivity? Or what happens to emotion-regulation in old age given the changes in brain activity discussed previously? Is there a mechanic basis to the age-related changes found in emotion-regulation (e.g., Labouvie-Vief, Lumley, Jain, & Heinze, 2003)? These and related questions are especially relevant when we describe and explain the findings about the development of behavioral indicators of emotional tone and approach/avoidance that are much closer to the pragmatics of personality next.

The Development of Behavioral Indicators of Life Mechanics of Personality

Emotional Tone and Reactivity. The physiological patterns are maintained, however the magnitude of physiological responses seems to be reduced (e.g., Levenson et al., 1991). Studies assessing emotion via self-reported positive and negative affect, that is indicators much closer to the pragmatic side of emotion-regulation, supported the view of a gain in affective functioning in old age. Overall the subjective salience of emotion seems to increase with age (e.g., Carstensen et al., 1999). Negative affect has been shown to either stay stable or decline in old age. Positive affect was found to be rather stable or even increasing with age depending on the study and the age range under investigation (e.g., Charles, Reynolds, & Gatz, 2001; Diener & Suh, 1998; Kunzmann, Little, & Smith, 2000). Increased affective complexity (i.e., more factors underlying emotional experience, plus higher potential for the co-occurrence of positive and negative affect) and improved reported emotional control were also linked to increasing age (e.g., Gross et al., 1997). A common interpretation of those findings is an age-related emotional maturation as

a result of accumulated experience and knowledge about emotions as well as a changing time horizon (e.g., Carstensen et al., 1999), that is, changes in the life pragmatics of personality. Based on the findings about neurophysiological indicators of the mechanics of personality presented earlier, we would like to offer some speculations about how those changes may contribute to these changes in emotional tone and emotion-regulation observed on the behavioral level.

First, as noted, there is indication that ANS activity (particularly the cardiovascular system) in reaction to elicited emotions is smaller and refraction times are longer in older adults in comparison with younger adults. Further, an age-related reduction of the asymmetry of prefrontal brain activity seems to occur. These changes (and we have only looked at a small selection of possible mechanic indicators) may contribute to the changes observed in emotional tone and emotion-regulation. For instance, lower ANS reactivity may make it easier to deal with upsetting emotional experiences. Decreased asymmetry in prefrontal brain activation during emotional experiences may contribute to differences in the relative frequency of specific emotional experiences and may predispose toward the processing of a particular kind of emotional quality.

Second, with regard to emotional control there is indication that in contrast to self-report assessment, behavioral measures of emotional control actually find no age-related increases but rather that older adults seem to overestimate their own ability to regulate their emotions as measured by physiological indicators (Kunzmann, Kupperbusch, & Levenson, 2005). And there is first indication that when using highly age-relevant emotional stimuli (loss of a loved one) older people actually report to experience *stronger* negative reactions (sadness) than younger ones (Kunzmann & Grühn, in press). Thus, it may be the case that certain constellations of emotional reaction are practiced more often than others and thus by pragmatics means (i.e., exercise) developmental trends based on the life mechanics of personality are "compensated." In sum, we suggest that the interplay between mechanic and pragmatics components of personality development is far from being understood but that the heuristic distinction between the mechanics and pragmatics of life may be quite helpful in order to increase our understanding of emotional functioning across the life span.

Approach and Avoidance Goals. Corresponding to the age-related declines in the mechanics of life, goal-focus is expected to shift with increasing age from growth, that is, trying to reach higher levels of functioning, toward maintenance, that is, preserving levels of functioning in the face of challenge, and regulation of loss, that is, organizing functioning at lower levels (Staudinger et al., 1995). Inspecting findings from research on the goal system (e.g., Emmons, 1996) that distinguishes goals focusing on gains, that is, approach goals, and goals focusing on the avoidance of loss, that is, avoidance goals, can be used to test this hypothesized developmental trend. And indeed in line with the assumption, it has been demonstrated that growth (approach) goals were more frequent in adolescence, while maintenance (avoidance of loss) goals increased in frequency during middle adulthood and into old age (Ebner & Freund, 2003; Freund, 2002; Heckhausen, 1997; Ogilvie, Rose, & Heppen, 2001). Further, maintenance goals still increase in frequency during very old age (J. Smith & Freund, 2002). Nevertheless, in spite of middle-aged and old people becoming more invested in maintenance and loss management, approach goals persist throughout life (Ogilvie et al., 2001). When asked about their future selves, even a majority among the very old consistently reported to pursue improvement goals across two measurement points (J. Smith & Freund, 2002). And elective selection is the component of the SOC theory that is maintained into old age (Freund & Baltes, 2002b). This pattern of findings is replicated across different methodological approaches, such as coding of goals by raters, self-rating of goals, and goal-selection behavior. Further, with regard to a systems view on goals it was demonstrated that one goal could receive ratings on the approach as well the avoidance dimensions (Ebner & Freund, 2003). Relating these behavioral and self-report findings on approach and avoidance to the evidence based on neurophysiological indicators it is striking that it is the right anterior cortex, which is related to avoidance behavior that seems to undergo stronger age-related declines in functioning suggesting that the goal-related approach/avoidance findings are more closely linked with the life pragmatics rather than the life mechanics of personality.

Evidence on the Development of the Life Pragmatics of Personality

In this last part of reviewing evidence on personality development, we turn to constructs that on our mechanic-pragmatic continuum are much closer to the pragmatic end such as personality traits, the self-concept but also

self-regulatory processes. A frequent distinction drawn in reviews of personality and aging (Kogan, 1990) is the one between trait and growth models of personality development.

Radical trait theorists equate personality with personality traits, that is, dispositional behaviors and attributes. Some even argue that personality is "set like plaster" after age 30 (Costa & McCrae, 1994). *Trait models of personality* approach the question of continuity and discontinuity and stability and instability from the continuity side. Trait-oriented researchers are interested in exploring and possibly arriving at a structure of personality characteristics that captures an individual's experiences and behaviors in a way that is as comprehensive and continuous as possible.

Among a large number of trait personality researchers there is consensus that personality can be reasonably well described by the so-called "Big Five." The Big Five have been identified by means of factor analysis across different instruments and different samples, though labels vary somewhat among authors. We have chosen Costa and McCrae's factor names to convey the information: Extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience.

Growth models of personality, in contrast, like the most influential one by Erik Erikson (e.g., 1959), contend that we continuously adapt to changing internal and external requirements and thereby grow. If all requirements are successfully met, at the end of an ideal trajectory, Erikson envisions a person full of hope, will power, purpose in life, competence, fidelity, love, care, and wisdom. Clearly, this outcome is not the rule but rather the exception.

More and more empirical evidence based on either of the two models, however, has demonstrated that *both* stability *and* change (i.e., gains and losses) characterize personality development in adulthood and old age. Thus, the focus of this overview will be on presenting this evidence and suggesting ways to better understand the dialectic between stability and change in personality development.

Development of Trait Personality. When asking about stability or change of personality traits, this implies three questions rather than one, that is, stability or change of (1) mean levels within a group of individuals, (2) inter-individual differences between individuals (variance), and (3) of the structural interrelationships of dimensions of personality (covariances). To start, a meaningful comparison between different age groups is solely possible if personality dimensions measure the same characteristics at different ages. For the Big Five factorial model of personality cross-sectional as well longitudinal information on structural invariance is available (Costa & McCrae, 1994; Small, Hertzog, Hultsch, & Dixon, 2003). Such studies have demonstrated high structural invariance during adulthood and into old age.

According to a recent meta-analysis (Roberts & DelVecchio, 2000), the rank-order stability of the Big Five increases almost linearly across the life span with stability levels in the .40 to .50 range during adolescence and a peak in stability at over .75 in middle adulthood (50 to 59 years). This peak of personality consistency at age 50 to 60 contradicts earlier arguments that the consistency of personality traits should plateau after age 30 (Costa & McCrae, 1994). Comparison among the five dimensions showed that extraversion and agreeableness had slightly higher stabilities than the other three dimensions (see also Vaidya Gray, Haig, & Watson, 2002). In this meta-analysis (Roberts & DelVecchio, 2000), stability estimates did neither vary by assessment method (i.e., self-report, other-report, projective test) nor by gender. Finally, controlling for sample attrition did not alter the results. The findings from this meta-analysis are confirmed with regard to old and very old age by recent publications from two longitudinal aging studies (Mroczek & Spiro, 2003; Small et al., 2003). In both studies, consistencies across 12 and 6 years, respectively, were around .7. No evidence has been found for cohort differences in consistency. Please note that even though a consistency of .75 at age 50 and 60 is high, on the assumption of higher reliability than stability, it leaves room for individual change. In this vein, recent studies using latent growth modeling found that with increasing age individual differences in personality change also increase (Pedersen & Reynolds, 2002; Small et al., 2003). As no age-graded increase but rather a decrease in the relative importance of genetic effects on personality development has been found, this increasing interindividual variability of change most likely is related to interindividual differences in life circumstances (Pedersen & Reynolds, 2002). Alternatively, it may also be the case that overall system robustness is reduced with age and thus greater intraindividual variability emerges (S.-C. Li, Aggen, Nesselroade, & Baltes, 2001; J. R. Nesselroade, 2002).

Finally, what happens with the mean levels of personality traits? Do we become less extravert and less open, but also less neurotic, as we move through adulthood and old age? Taking into account cross-sectional and longitudinal evidence, it seems that neuroticism decreases across adulthood (Mroczek & Spiro, 2003) and may show some increase again very late in life (Small et al., 2003). Some decrease is also found for openness to experience and extraversion (e.g., Costa, Herbst, McCrae, & Siegler, 2000). In contrast, agreeableness and conscientiousness increase to some degree (Helson & Kwan, 2000).

This mean-level decrease in neuroticism, increase in agreeableness and conscientiousness across adulthood and into old age can be described as an increase in social adaptation, in the sense of becoming emotionally less volatile and more attuned to social demands (Helson & Wink, 1987; Staudinger, 2005; Whitbourne & Waterman, 1979). The decrease in openness to experience, in contrast fits a different developmental pattern that is discussed next.

McCrae and others (e.g., 2000) lately offered an interesting proxy of a longitudinal study. Comparing samples between age 14 and 83 years from Korea, Portugal, Italy, Germany, Czech Republic, Turkey, they found cross-country consistency with regard to the pattern of mean-level changes just described. The authors argue that the observed similarity across cultures makes it unlikely—given the very different historical and cultural circumstances in these different countries—that such age differences are indeed cohort differences. Instead the authors suggest that this developmental pattern may reflect changes in genetic expression selected for by evolution (McCrae et al., 2000). Thus, using the terminology introduced in this chapter, McCrae and others view those results as reflecting changes in the life mechanics underlying personality functioning.

Knowing the many different ways that genes and environment interact in order to produce stability (cf. Plomin, DeFries, & Loehlin, 1977; Roberts & Caspi, 2003) and also how important specific life experiences are in personality development (e.g., Magnus, Diener, Fujita, & Pavot, 1993), we are somewhat reluctant in accepting this explanation as the only valid alternative. For example, the transition to partnership during early adulthood is accompanied by decreases in neuroticism and shyness and increases in conscientiousness (Neyer & Asendorpf, 2001). Thus, personality changes can also be attributed to normative, in the sense of culturally shared, life events. For instance, a recent cross-sequential study found that two cohorts differed in their development of neuroticism between the ages of 70 and 75 (Mroczek & Spiro, 2003). The older cohort (1897 to 1919) showed stability whereas the younger cohort (1920 to 1929) showed decline in neuroticism pointing to the fact that aging might express itself differently in different cohorts.

In sum, when we return to our heuristic dual-component model of the mechanics and pragmatics of life, we question the degree to which the Big Five are prototypical elements of the life mechanics, as McCrae and others (2000) suggest. In our view, the Big Five are prototypical elements of the life pragmatics. They are the result of an endless number of interactions between biology, culture, and the person. Thus, aside from stable genetic components, their relative high degree of stability can also be located in the physical and social environments in which individuals live and which, as sociological theories of human development and social differentiation suggest (Settersten, 2005), evince systematic and stable interindividual differences. Therefore, in our view personality traits likely are much less of an exclusively biological nature than is assumed to be the case for the more fundamental elements of the personality system such as basic emotional tone and basic motivational tendency.

Using a psychometric approach to the study of *growth-aspects of personality* replicates and extends the finding of increased social adaptation just described for the Big Five. Measuring dimensions such as "environmental mastery," "autonomy," or "personal growth" and "purpose in life," Ryff and Keyes (1995) find that the first two dimensions increase with age during adulthood and old age and the latter two level off after midlife. The increases in environmental mastery and autonomy can be described as being highly functional and adaptive for mastering adult life.

Personal growth and purpose in life, however, level off in midlife. This developmental trend fits well with the decline observed in openness to new experiences in old age. It has been argued (Staudinger, 2005), that these observed declines in self-reported openness, personal growth and purpose in life, may indicate that in contrast to social adaptation, personal maturity is less likely to come with age for most people. And indeed studies of wisdom (e.g., Staudinger, 1999b) and of ego development (e.g., Labouvie-Vief et al., 1987) find no normative increase with age during adulthood.

Self-Concept Development. When studying the self-concept both content and structure need to be considered (e.g., Filipp & Mayer, 2005; Staudinger & Pasupathi, 2000). Therefore, developmental trajectories of both will be covered next.

The *content* of the self-concept refers to the beliefs we hold about ourselves and to the domains we employ when describing ourselves. Answers to questions like "Who am I?" (e.g., Freund & Smith, 1999) are indicators of the content of the self-concept. The content of spontaneous self-descriptions shows change, but also stability (Filipp & Klauer, 1986). There is, for instance, substantial stability in the content of self-definitions across different age groups when it comes to central domains of life (e.g., health, social relations; Filipp & Klauer, 1986). But there is also change that can be attributed to the influence of a succession of developmental tasks, critical life events, and also changes in the life mechanics. During childhood the academic self-concept and school achievement assume a central role, in adolescence we are very much concerned about our physical appearance (for an overview cf. Filipp & Mayer, 2005). With increasing age, however, people define themselves more and more in terms of health and physical functioning, life experiences, and hobbies (Dittmann-Kohli, 1991; Freund & Smith, 1999). Another aspect of this adaptation to aging seems to be that activity and agency become important parts of the self-definition in old age, as they are no longer self-evident (Freund & Smith, 1999; Herzog, Franks, Markus, & Holmberg, 1998).

The *structure* of the self-concept refers to the organization of the self-concept. This organization is often investigated in terms of its complexity and integration (cf. Campbell, Assanand, & Di Paula, 2003). One classic definition of complexity (or differentiation) taps the number of nonredundant self-aspects or content categories of the self-definition (Linville, 1987). Integration often is assessed as the correlation of trait ratings across different domains of the self-concept (Donahue, Robins, Roberts, & John, 1993).

Cognitive representations of the self emerge during the 2nd year of life (cf. Harter, 1998) and can be characterized with regard to the degree of differentiation (measured in terms of correlations among different self-concept domains) as early as 4 to 5 years of age (Marsh et al., 2002). During childhood, the average correlation among self-concept domains has been shown to become smaller. This trend of decreasing integration levels off during adolescence, where no further decline in average correlations between preadolescence and late adolescence has been demonstrated (cf. Marsh et al., 2002). In contrast, there is evidence that the self-structure becomes more integrated again and that self-complexity increases between 18 and 22 years of age (Elbogen et al., 2001). For the age range from 20 to 88 years, cross-sectional findings indicate an U-shaped relationship between self-concept integration and age (Diehl et al., 2001). Currently, there is not much evidence on the rank-order stability of self-complexity or differentiation. 1-week test-retest correlations for measures of self-complexity and integration are in the .60 range (Campbell et al., 2003). No knowledge about long-term stability is available.

In sum: It seems that mean levels of integration of the self-concept increase until adolescence, decrease up to midlife and increase again thereafter. In contrast, the trajectory of self-complexity (in the sense of number of relevant self domains mentioned) follows an inverted U-shape function during adulthood. Thus, in contrast to the orthogenetic principle proposed by Heinz Werner (1926), one of the pioneers of developmental psychology, normatively there seems to be no coexistence of complexity and integration. In this vein, recently an effort has been made to develop a measure of self-concept growth, which incorporates this combination of differentiation and integration, and no significant age differences have been found during adulthood (Staudinger, Dörner, & Mickler, 2005).

Development of Self-Regulatory Processes. Having discussed some of the major evidence on the content and structure of self and personality, we turn next to results about the self-related processes. Self-regulation includes both the agentic (assimilative, primary control, problem-focused coping) and yielding qualities (accommodative, secondary control, emotion-focused coping; P. B. Baltes & Baltes, 1990b; Brandtstädter & Greve, 1994; Brandtstädter & Rothermund, 2003; Heckhausen & Schulz, 1995). Accommodative and yielding qualities have consistently been found to increase with age (e.g., Brandtstädter & Renner, 1990). Most likely this is a pragmatic response to the declines in the mechanics of life. In contrast, theoretical predictions and findings with respect to the development of agentic and assimilative qualities are inconsistent. Different authors speak of declining (Brandtstädter & Renner, 1990), stable (Heckhausen & Schulz, 1995), and even increasing

(Heckhausen, 2000) primary control across adulthood. In line with findings of increase and stability of primary control is evidence that demonstrates that older adults report elective, self-governed selection (within the model of selective optimization with compensation) as their primary action strategy (Freund & Baltes, 2002b).

Human beings are producers of their development (R. M. Lerner & Busch-Rossnagel, 1981), but there are also times when to accept the limits of our agency and to cope with challenges, threats and losses (see P. B. Baltes et al., 1998; P. B. Baltes & Smith, 2004; Brandtstädter, 1998; Staudinger & Lindenberger, 2003). And indeed, it may be that with age self-regulatory behaviors differ markedly in their prioritization. In order for people to maintain active involvement as composers of their lives, it is crucial to believe in one's ability to control and select environments, optimize outcomes, and to have compensatory strategies dealing with emotions in situations of failure and stress (e.g., Freund & Baltes, 2002b). In the following, we are interested in the developmental trajectories of various facets of self-regulation, such as (a) internal and external control beliefs, (b) emotion-regulation, as well (c) goal setting and goal pursuit.

Control and Self Efficacy Beliefs. When considering the development of control beliefs and related beliefs such as self efficacy (Bandura, 1997), one variable in the equation has to be the actual potential for control afforded by current psychological and nonpsychological resources. Based on the overall life span architecture presented earlier (P. B. Baltes, 1997), there is reason to assume that our capacity to influence outcomes in the external world follows an inverted U-shaped trajectory across the life span (primary control potential: Heckhausen & Schulz, 1995). Thus, the rise in objective control potential during childhood and adolescence may be reflected in increasing internal control beliefs, while the declining control potential in old age may be accompanied by declining internal and increasing external control beliefs. However, the ontogenesis of control beliefs is a little more complicated than this assumption would suggest.

If the two dimensions are considered separately, which is the current state of the art in research on control beliefs (E. A. Skinner, 1996), interesting differences between the development of internal and external control beliefs have been found. For instance, children from age 8 to 14 show no systematic *mean-level change* in internal control beliefs, but external control beliefs (powerful others) decline (cf. E. A. Skinner & Connell, 1986). Further, stability and even increases in internal control beliefs with increasing age are observed. In adult samples, no clear-cut changes in perceived internal control and a tendency for older adults to report more external control are found (Brandtstädter & Rothermund, 1994). A global measure of perceived internal control demonstrates increases between young adulthood and old age (up to age 75; Lachman & Weaver, 1998).

Recent findings from the Berlin Aging Study (a sample of old and very old adults) indicate that a high sense of internal control can be maintained into very old age, that is, in spite of losses and functional decline the old adults did not report diminished internal control over desirable outcomes. Simultaneously, however, mean levels of perceived others' control increased (Kunzmann, Little, & Smith, 2002). Thus, there seems to be a consistent pattern of increasing externality in control beliefs with increasing age. Results for internal control beliefs are less clear. We can conclude that beliefs in one's ability to control desirable outcomes are relatively stable during adulthood and might even show some increases with age. In other words, the belief in our agency "survives" actual losses in resources. Age differences in domain-specific control beliefs show that control over children and sex life decreases, while control over work, finances, and marriage increases between young adulthood and old age (Lachman & Weaver, 1998). Control over mental functioning and health declines in very old age (Lachman, 1991).

Selected evidence on the *rank-order stability* of control beliefs points to moderate stability estimates ranging between $r = .45$ and $r = .57$ (Brandtstädter & Rothermund, 1994; Kunzmann et al., 2002; Lachman, 1986b). In sum, findings on the stability of control beliefs suggest increases (external control) or stability (internal control) and moderate stability in interindividual differences across time.

Coping. When we turn to age-comparative research on coping, Folkman, Lazarus, Pimley, and Novacek (1987), for example, found that older respondents were less likely to seek social support or use confrontive coping and were more likely to use distancing and positive reappraisal. In fact, more and more of the recent evidence supports this "growth" view of coping in adulthood and old age (e.g., Aldwin, Sutton, & Lachman, 1996; Costa & McCrae, 1993;

Labouvie-Vief, Hakim-Larson, & Hobart, 1987; Rott & Thomae, 1991) or at least speaks for stability in coping behavior. With respect to the developmental stability of coping behavior during adult life, it has also been observed that individual differences in the endorsement of coping mechanisms are more a function of the type of stressful event than of age (McCrae, 1989).

Furthermore, older adults seem to be more flexible in adapting their coping response to the characteristics of the situation (e.g., controllability) than younger adults (e.g., Aldwin et al., 1996). Such evidence is congruent with findings that, in comparison to younger adults, older adults have been found to demonstrate an accommodative coping style in the face of adversity or failure; that is, older adults were more flexible and better able to adjust their strivings to changed circumstances than were young adults (Brandtstädter & Renner, 1990). Conversely, younger adults were more likely to adhere to their once established goals (i.e., assimilative coping), even if they were no longer realizable. With age, Brandtstädter and Renner (1990) have demonstrated that adults favor *accommodative* (goal flexible) over *assimilative* (goal persistent) coping. In a similar vein, Heckhausen and Schulz (1993) have proposed and presented empirical evidence (Heckhausen, 2000) that an age-related shift from *primary* to *secondary control* strategies takes place in order to master the tasks of aging.

Personal Life Investment (PLI) and the Goal System. Self-regulation is also reflected in goal setting and goal pursuit (cf. Cantor & Blanton, 1996). The *goals* people hold at different points in their life and how they try to achieve these goals in part are reflections of developmental contexts and developmental tasks. For instance, although family related goals are prominent throughout adulthood, young adults frequently mention marriage and family goals, whereas the goals of middle-aged adults relate to the lives of their children (Nurmi, 1992). Another well-established finding is that occupational goals lose priority with increasing age, while health-related pursuits do gain (e.g., Frazier, Hooker, Johnson, & Klaus, 2000). Ryff (1989b) demonstrated that younger people strive for accomplishment and career, whereas older people are more likely to aim at good health and the ability to accept change. In another vein, Riediger, Freund, and Baltes (2005) have suggested that the degree of goal convergence and interference may be considered another kind of relevant age-related change in the goal system.

Thus, whether the goal system shows more change or stability seems to be an issue of perspective. Although change in the goal system is evident, continuity has also been demonstrated (Frazier et al., 2000; Smith & Freund, 2002). For instance, across a 5-year period, people in late adulthood and old age tended to consistently mention the same domains of possible (future) selves at two measurement occasions (Frazier et al., 2000). And even for the old and oldest old more stability than change was reported with regard to the domains of possible selves across a 4-year period (Smith & Freund, 2002). Obviously, as was true for our discussion of the trait literature, evidence suggests that continuity as well as discontinuity play a role in age-related changes of the goal system.

Personal life investment (PLI), one aspect of the goal system, is defined as the amount of energy and effort (in terms of both acting and thinking) that people invest in central life domains (e.g., Staudinger et al., 1999). This broad conception of investment in terms of thought and action allows to capture all aspects of the motivational process, that is, goal selection, planning, and goal pursuit, but also disengagement from blocked goals and restructuring of goal hierarchies. The development of PLI in ten life domains (health, cognitive fitness, independence, well-being of one's family, relationships with friends, sexuality, hobbies, one's occupation or similar activities, thinking about one's life, and one's death and dying) has been studied across the entire adult life span.

Cross-sectional evidence from a sample ranging in age from 14 to 103 years demonstrated that the investment patterns across these ten life domains indeed reflect the developmental tasks of the respective life periods (Staudinger & Schindler, 2005). Certainly, age and its related social and biological demands is only one developmental context influencing investment patterns. In addition, socioeconomic characteristics and personality play an important role in moderating age-related differences in investment patterns. Finally, a distinction between investment related to age-graded societal and biological demands (obligatory) and self-selected investment (optional) turned out to be useful. These two types of investments follow stable and declining trajectories, respectively, as analyses with the longitudinal data from the BASE showed (Schindler & Staudinger, 2005b).

Summary on Stability and Change in Personality across the Life Span

Considering the evidence on the development of personality structure presents only half of the picture. Without the investigation of personality processes, we may be lead to think that personality and aging is about some increases in social adaptation and decreases in personal growth. Taking self-regulation and developmental regulation into account, however, "complicates" the story. Yes, there is stability that can be associated with enduring genetic and contextual influences. And there is a psychological need for coherence and stability that allows us to have a sense of enduring self. Stability, however, should not be completely equated with standstill. Rather, stability is also reflective of resilience. Considerable regulatory processes "produce" that stability. In addition to biological changes, change on the structural level of personality occurs when self-regulation cannot withstand the pressure for modification any longer. In the future, we need to better understand the biological underpinnings of personality functioning and how they change with age and interact with contextual features and individual choices.

Reserve Capacities of Self and Personality Development

As a further life span problematic, we have selected the notion of reserve capacity and resilience for further elaboration. This notion gains special importance for a functional perspective on personality development, that is, for perspectives that aim at an analysis of the orchestration of self and personality as a system of adaptive functioning. The topic of reserve capacity and resilience in the domain of self and personality relates to the allocation of resources introduced earlier but discusses this theme at a more microanalytic level of analysis. What are the self-related mechanisms and characteristics that either show or contribute to reserve capacity?

Traditionally, the central role of reserve capacity, or related concepts such as resilience, is articulated within the province of child development (e.g., Cicchetti & Cohen, 1995). More recently, this view was extended to include adulthood and old age (e.g., Brandtstädter, Wentura, & Rothermund, 1999; Staudinger et al., 1995; Vaillant, 1993). For the present purpose we have chosen aging as a forum of illustration. We make this selection for several reasons. One is the relative novelty of this age period for researchers in child development. Another is because presenting research on aging permits us to elaborate more clearly the theme of gains and losses and the dynamic of differential allocation of resources into growth, maintenance, and management of losses.

We discussed that there is little or no correlation between age and trait-based personality structure. In a similar vein, there is little correlation between age and various self-related indicators of adaptation (e.g., P. B. Baltes, 1993; Brandtstädter, Wentura, & Greve, 1993), including self-esteem (e.g., Bengtson et al., 1985), sense of personal control (e.g., Lachman, 1986b), or happiness and subjective well-being (e.g., Costa et al., 1987; Ryff, 1989a). This also includes 70- to 80-year-olds (J. Smith & Baltes, 1993). Only in advanced old age, do we seem to observe more salient changes toward a lower level of desirable functioning in trait-like dispositions (P. B. Baltes & Smith, 2003; J. Smith & Baltes, 1999). Thus, on the group level, for the larger part of the adult age spectrum, age does not seem to be a "risk" factor for these aspects of the personality system (note, however, that age challenges become larger when comparison with younger ages are requested).

The absence of strong relationships between age and self-related indicators of well-being, despite what we have characterized above as an increase in risks and potential losses with advancing age, but also for certain especially disadvantaged groups, is theoretically and methodologically important. Indeed, the discrepancy between an increasing number of risks on the one hand, and maintenance of adaptive functioning in the self on the other, is perhaps one of the most persuasive indicators of the power of the personality system in dealing with reality (P. B. Baltes & Baltes, 1990b; Greve & Staudinger, in press; Staudinger et al., 1995). It is suggested that the personality system exhibits resilience, or reserve capacity, in the face of age-related risks and primarily health-related losses. In a similar way, it has been argued in childhood research conducted in the field of developmental psychopathology that certain self and environment constellations allow maintenance of adaptive development even in the face of adversity (e.g., Garmezy, 1991).

Multiple arguments can be presented to understand this discrepancy between an age-related increase in risks and stability in self-related indicators of well-being (Staudinger, 2000). First and foremost, the self applies various protective mechanisms to reinterpret or transform reality in the interest of maintaining or regaining levels of well-being (e.g., M. M. Baltes &

Baltes, 1986; Filipp, 1996; Greve & Wentura, 2003). Second, age is only a rough proxy of increasing risks; not everyone of a given age cohort needs to be concerned by them. Therefore, the negative effects need not necessarily show on a group level. Third, as just argued, the self has a strong interest in continuity and growth. Over a given period of time, the self adapts to even adverse circumstances as if nothing or not much has happened. Thus, for researchers interested in the "self at work," it seems crucial at which point in this adaptive process the assessment takes place. Fourth, the changes due to increasing risks may be chronic rather than acute and therefore might not affect the self suddenly, but gradually. It may be difficult, therefore, for the self to recognize them and reflect them in self-report measures.

In the following, we will illustrate the reserve capacity of the personality system by citing select findings ordered according to the distinction introduced above between (a) form and structure of the personality system and (b) self-regulatory and self-transformational processes. Except for few studies with objective indicators of adaptivity, such as longevity or professional success, in most of the studies adaptivity is measured by self-report indicators of well-being. First, with regard to form or structure we will highlight information on differences in the adaptive fitness of personality and self profiles. Second, we will select evidence on the adaptive value of self-regulatory processes in three domains for further illustration of life span developmental changes: (1) goal seeking and reorganization; (2) self-evaluative comparison processes; and (3) coping. Finally, note that the protective mechanisms described in the following are an inherent part of theories of successful development such as the theory of selective optimization with compensation (P. B. Baltes & Baltes, 1990b).

Evidence for Reserve Capacity in Indicators of Personality Structure

There is longitudinal and cross-sectional evidence that individual differences in largely stable personality characteristics contribute to level of adaptation and sometimes even advances. From a life span perspective, it is important to note that the adaptive patterns differ somewhat depending on the first time of assessment (i.e., adolescence or adulthood) and thus whether short- or long-term predictions are involved. This applies especially to two traits widely assumed to constitute a risk or a protective factor, that is, neuroticism and optimism or cheerfulness (Friedman et al., 1995; Scheier & Carver, 1987). One possible explanation for the contradictory finding with regard to cheerfulness and optimism might be that cheerfulness in adolescence is linked to certain risk behaviors whereas optimism in adulthood is related to higher levels of positive emotions, which have protective effects in the face of stress (e.g., Fredrickson & Levenson, 1998). As very few life time studies are available, our knowledge about the long-term protective personality profile to date is still limited. Nevertheless, it seems safe to say that across a number of studies, positive expressions of the following personality characteristics have been demonstrated to mostly contribute to positive outcomes, thus, can be called general-purpose mechanisms (cf. Friedman et al., 1995; Helson & Wink, 1987; Manners & Durkin, 2000; Peterson, Seligman, Yurko, Martin, & Friedman, 1998): *Conscientiousness, extraversion, openness to experience, behavioral flexibility, ego resilience, ego level, internal control or agency (efficacy) beliefs, and cognitive investment.*

Another strand of research focuses less on trait-based personality characteristics than on the structure and content of self-conceptions. Evidence is accruing that a positive, multifocal and diversified, yet integrated structure of priorities and self-conceptions, or identity projects, makes transactive adaptation to developmental changes easier (e.g., Diehl et al., 2001; Freund, 1995; Riediger et al., 2005).

It is recent work that has shown that understanding the adaptivity of self-definitions is more complex than first thought. Combining dimensions like quantity, richness, positivity, integration, and importance of self-definitions, as well as differentiating real and potential selves in one theoretical framework will be an important step in capturing the adaptive life span dynamics of self-knowledge. Very important also seems a more explicit recognition of contextual factors including issues of collective self-concepts such as among spouses (M. M. Baltes & Carstensen, 1999; Hermans, 1996).

Evidence for Reserve Capacity in Self-Regulatory Processes: The Goal System and Self Evaluation

Selection of Goals and Life Priorities. Life span theory (P. B. Baltes, 1997) emphasizes the critical importance of selection of domains and life priorities for effective regulation of developmental processes such as advancement, maintenance, recovery and regulation of loss. In this sense, personality traits as well as possible selves act as motivational sources, and are linked to goals that are either strived for or avoided.

The evidence on life span development of life priorities and personal life investment patterns reported above indeed points to selection into individual life contexts and the importance of internal and external contexts in defining salient features of the self across the life span (see also Brandtstädter & Rothermund, 1994; Cantor & Fleeson, 1994; Carstensen, 1995; Staudinger & Schindler, 2005). Socioemotional selectivity theory, for instance, argues for systematic and adaptive life span changes in social goals over the life span (e.g., Carstensen et al., 1999). So, temporal constraints like impending end of life may shift the criteria used for selecting social relationships, requiring a corresponding change in the criteria for judging a particular relationship as adaptive (e.g., Carstensen et al., 1999).

Beyond the social realm, the adaptive value of life priorities in general seems to change. For example, older adults find meaning in life predominantly by searching for "contentment," whereas younger adults report searching for "happiness" (Dittmann-Kohli, 1991). Younger people tend to assess their subjective well-being in terms of accomplishments and careers, whereas older people associate well-being with good health and the ability to accept change (Ryff, 1989a). These changes are highly adaptive and illustrate the importance of flexibility—giving up or reducing investment in those roles and commitments that are no longer available, and investing in commitments which fit current conditions of living (e.g., Brim, 1992; Dittmann-Kohli, 1991; Freund & Baltes, 2002b). Flexibility in goals and investments, or priorities, is of course facilitated by a rich variety of self-defining concepts to select from and prioritize. In this sense, a rich variety of interrelated but well-articulated life goals is part of a person's developmental reserve capacity (cf. Staudinger et al., 1995; Riediger et al., 2005).

In addition to the repertoire and selection of goals, other facets of goal pursuit also relate to adaptation. Achieving a goal is usually adaptive, but the meaningfulness of the goal and the degree of commitment to it may enhance or limit that adaptivity (see also Brunstein, 1993; Emmons, 1996). Further, one must act; one study demonstrated that the relationship between people's goals and well-being was primarily mediated through doing more in the selected domain (Holahan, 1988; see also Harlow & Cantor, 1996). Recent evidence suggests that the pursuit of approach goals (or hoped-for selves) is related to greater well-being, while that of avoidance goals (or feared-for selves) relates to less well-being (e.g., Carver & Scheier, 2003; Elliot, Sheldon, & Church, 1997). Most of this research is done with young adults and much less is known about changes over the life span. Due to reduced resources and increased risks, avoidance goals seem to be more prevalent in later life and lose the dysfunctional effect which they evince in young adulthood (Freund & Ebner, in press). In old age it is the maintenance goals that demonstrate the highest adaptive value.

The adaptiveness of goal investment is also altered by life circumstances. Given highly restrictive life circumstances, such as major health constraints, concentration on a few selected goals rather than many helps to sustain levels of subjective well-being (Staudinger & Fleeson, 1996). This finding has been replicated with longitudinal data from the Berlin Aging Study (Schindler & Staudinger, 2005b). When considering a life span sample, it was found that it is during middle adulthood and into old age that the exact composition of the investment pattern (i.e., the selection pattern) contributes significantly to subjective well-being (Staudinger & Schindler, 2005).

The Adaptive Value of Self-Evaluations. In addition to changes in content, ranking, and valence of self-concepts and goals, self-evaluative processes can be considered protective or risk factors. Three motives of self-evaluation (see Fiske & Taylor, 1991) can serve protective functions—self-verification, self-enhancement (e.g., Taylor & Brown, 1988), and self-improvement (e.g., Taylor, Neter, & Wayment, 1995).

General statements such as "positive illusions are adaptive" are simplistic (cf. Taylor & Brown, 1988; Colvin & Block, 1994; Baumeister, 1989). It's important to know when positive illusions are adaptive (e.g., at which point in the action sequence; see e.g., Schwarz & Bohner, 1996). It may, for instance, be adaptive to have positive illusions before the action is completed to maintain motivation. But it may be dysfunctional to maintain positive illusions during implementation and when interpreting outcomes, because this reduces the likelihood of an adequate response (Oettingen, 1997). Consistent with this reasoning, people think more realistically when setting goals than when implementing them (Taylor & Gollwitzer, 1995). The particular content of the illusions is also important. For example, positive expectations about behavior outcomes contrasted with negative fantasies about the same outcome can result in the best behavioral outcome (Oettingen, 1996). Such unresolved recent issues

qualify the existing literature on the adaptivity of self-evaluations, which we address next.

Self-Evaluation: Social Comparisons. Goals shift in any activity during the life span, and those shifts lead to shifts in the selection and weighting of comparative information (Bandura & Cervone, 1983; Frey & Ruble, 1990). Individuals also modify their self-evaluative standards within a given domain in order to adapt to decreases in their behavioral competence or negative changes in their health condition, thus maintaining stability in their self-views (Buunk & Gibbons, 1997; Frey & Ruble, 1990).

Social comparison and other forms of interactive minds (P. B. Baltes & Staudinger, 1996a) are one important mechanism of self-regulation (e.g., Wood, 1996). New reference groups are selected or sometimes even constructed in order to permit a reorganization of personal standards of evaluation (e.g., Buunk, 1994). Downward comparisons, in which individuals compare themselves to people who are worse off in a relevant domain of functioning, may become more important with age, increasing levels of risk, or losses that cannot be remedied through instrumental action (e.g., Filipp & Mayer, 2005; Heckhausen & Krueger, 1993; Heidrich & Ryff, 1993). Of course, little is known about the level of consciousness at which people make such comparisons in everyday life.

The downward comparison story is not as simple as it seems, however (see also Wood, 1996). The operationalization of downward social comparisons varies markedly between studies. Some studies evaluate spontaneous reasons for self-evaluations provided "online," which are later coded for comparison standards. Other studies ask in retrospect for the frequency with which social upward, downward, and lateral comparisons are made and relate this to measures of well-being (e.g., Filipp & Buch-Bartos, 1994). Still other studies have participants rate themselves and a generalized other on certain personality dimensions, and then indirectly infer upward or downward comparisons (e.g., Heckhausen & Krueger, 1993). As suggested above, the most critical issue for adaptivity may be the use of the most functional comparison at the appropriate time during the person-situation transaction, something seldom addressed in these studies.

Self-Evaluation: Lifetime Comparisons. Besides social comparisons, comparisons with oneself at different times in the life span constitute an important resource for the self. As noted earlier, evidence on lifetime trajectories of social and lifetime comparisons remains scarce. In one study, higher frequency of future-oriented comparisons by older participants was related to lower well-being (Fillip & Buch-Bartos, 1994). In contrast, drawing on past successes in difficult situations can produce adaptive outcomes (Aldwin, Sutton, Chiara, & Spiro, 1996; see also Staudinger & Fleeson, 1996). Obviously, it is critical to distinguish between upward and downward temporal comparisons, as past and future comparisons can involve standards of better or worse functioning. It is not the temporal comparison per se that is protective or damaging; rather, depending on the characteristic or domain, and on the point in the self-regulatory process, lifetime comparisons can result in an enhanced self-evaluation or a sense of loss and decline. Selectively attending to positive aspects of the self at different points in the lifetime can support a positive sense of self at the present. The endorsement of selective lifetime comparisons may contribute to the lack of age differences in concurrent self-evaluations.

Longitudinal work has demonstrated that self-perceived personality change may be biased by what one might call "time enhancement" (Woodruff & Birren, 1972). Participants perceive improvement as compared to their own past, whereas the actual ratings collected at the two occasions (25 years apart) did not reveal significant change (see also Ross, 1997). Unfortunately, no interactions with age in this tendency to upgrade the past were tested. Other work on self-perceived personality change shows that discrepancies between ratings of past, present, future, and ideal personality are especially pronounced for young adults and hardly existent for older adults (Ryff, 1991; see also Ross & Bühler, 2001). It seems adaptive—and in line with respective developmental tasks—for young adults to strive for improvement and thus perceiving the past and the future to be of a different category (contrast effect; Schwarz & Strack, 1999). While for older adults, with decreasing resources, it seems adaptive to conceive of the future as being close to the present and the past and perceiving them as belonging to one category (assimilation effect; Schwarz & Strack, 1999). In this vein, a recent study found that in old age perceptions of ourselves in the past and the future have a stronger predictive value for our well-being in the present than in young and middle adulthood, which

may in fact contribute to perceiving fewer changes (Staudinger, Bluck, & Herzberg, 2003).

Persons' current view of themselves may not be meaningful unless we also understand how they believe they once were and will become. Being moderately extraverted in the present when having been very extraverted in the past has different implications for well-being than being moderately extraverted in the present and introverted in the past. Fleeson and Baltes (1998) showed that past and future ratings of personality predicted well-being above and beyond present ratings. When only current personality is assessed, the absence of information about change may mask relationships between personality perceptions and well-being (see also Fleeson & Heckhausen, 1997). Similar cautions apply to goal assessments. Regrets about past, unattained goals predict lower subjective well-being over and above current goal ratings and general tendencies toward negative affect (Lecci, Okun, & Karoly, 1994).

Coping and Control Strategies: Further Evidence for Reserve Capacity Related to Self-Regulatory Processes

In contemporary contextual models of coping (e.g., Brandtstädter & Greve, 1994; Filipp, 1999; Heckhausen & Schulz, 1995; Lazarus, 1996; Staudinger et al., 1995) questions of adaptivity are conditioned on the particular situation, including all its inherent constraints and demands. Whether a coping behavior is adaptive depends entirely on who does it, in response to which stressor, and in which situation the behavior occurs. In this vein, increasing evidence highlights the importance of context. For example, depending on a person's level of physical impairment, different coping styles are related to subjective well-being (Aldwin & Revenson, 1987; Staudinger & Fleeson, 1996). What has been labeled "regressive" and thus dysfunctional coping under "normal" living circumstances (e.g., "I like someone to take over," "denial," "I give up") is functional under conditions of physical impairment. Thus, older adults' "regression" in coping styles may be adaptive, given higher incidences of physical constraints (Staudinger et al., 1999). Of course, even "normally" adaptive behaviors are noneffective if not well executed (e.g., Suls & David, 1996).

Beyond the adaptivity of specific coping behaviors, it is important to have multiple coping options to choose from, while retaining some selectivity. Those old individuals who report selective flexibility in coping, that is endorsing some coping styles very strongly and others not at all, also demonstrate high levels of well-being (Staudinger & Fleeson, 1996). Similar findings are reported for coping with depression in old age. Rather than any particular form of coping, better mental health means being able to choose from several different responses (Forster & Gallagher, 1986). In a similar vein, the integrated multiplicity and selectivity (with regard to importance) of self-definitions has protective value, and social relations with multiple functions are a richer resource than other types of relationships (for an overview, see Staudinger et al., 1995). This evidence suggests that access to, and flexible selection from, a repertoire of regulating functions or characteristics (e.g., coping, self-definitions, functions of a relationship, life investments) may be a key resource used by individuals in proactive adaptation.

People obviously show highly adaptive coping behavior well into old age. In contrast to stereotypical views of the elderly as rigid, the evidence based on social-cognitive processes of self-representation, self-regulation, and self-enhancement, points to a substantial capacity for adjustment to and mastery of life's demands. Of course, this capacity for adaptation may find its limits in extreme situations, such as the challenges of advanced old age (P. B. Baltes & Smith, 2003; J. Smith & Baltes, 1999).

Many facets of coping and control processes remain uninvestigated or poorly understood, however, including the microgenesis of coping processes (e.g., Lazarus, 1996). To outline one example—findings suggest that the critical factors in success at quitting cigarette smoking involve being reflective and thoughtful (e.g., emotion/self-focused) at a planning stage and then problem-focused and behavioral during the actual quitting process (Perz, DiClemente, & Carbonari, 1996). As in the case of self-evaluative cognitions, it is also crucial to focus on the timing of coping. We need to consider which coping behavior is exhibited at which point in the coping process (e.g., Suls, David, & Harvey, 1996). For instance, longitudinal studies in the domain of coping with cancer (e.g., Filipp, 1999) and with death of a close person (e.g., Wortman & Silver, 2001) demonstrated that coping strategies such as "minimizing the threat" and "wish for someone to take over" maintained their adaptive power across a period of 9 months after the critical event. In contrast, the strategy "rumination" only showed positive relations during the first 3 months and turned into being maladaptive thereafter.

Summarizing Foci and Facets of Personality Development across the Life Span

In this section, we brought together theory and research from three different areas of research, that is, trait personality, the self-system, and self-regulatory processes. Each of these areas is characterized by their own foci and methodological approaches. We have argued that a life span perspective on personality development, rather than viewing these three approaches as relatively independent from each other or even mutually exclusive, tries to incorporate and integrate theoretical and empirical evidence from these fields. Dynamic systems theory and similar theoretical perspectives such as models of successful development provide useful theoretical guidance for this endeavor.

1. A central feature of personality development is the emergence of structure and of an associated system of self-regulatory mechanisms that mediate successful transactional adaptation. Beginning in childhood, we obtain solid evidence for structure, a sense of coherence, and some stable modes of adaptive behavior (e.g., Caspi & Bem, 1990). Such a view is represented in dynamic-system models of development (Magnusson, 1996), where principles of structural emergence and self-organization are critical for successful ontogenesis. Structural organization and coherence of personality, self, and self-regulatory mechanisms are a necessary precondition (constraint) for adaptive fitness and further growth. In this sense, the ensemble of features described function as general-purpose mechanisms.

2. Theory and research have advanced beyond the traditional trait versus change contrast. Traits themselves are part of the dynamic personality system. Thus, even stability is developmental in the sense that it is the result of surviving continuous challenge. Indeed, we do change during adulthood and old age but to a degree that does not jeopardize our sense of continuity. Personality development is characterized by a dialectic between trait expressions and self-regulation at work.

3. We have started to explore the fertility of extending the distinction between the biologically driven cognitive mechanics and the culturally driven cognitive pragmatics to also cover the field of personality functioning. The result of this endeavor is a heuristic model that distinguishes between the biologically driven mechanics and the culturally driven pragmatics of life. The two neurophysiological indicators selected to represent the mechanics of life, that is, heart rate activity and cerebral asymmetry, seem to evince less steep increases in the beginning and lesser decreases at the end of life; as well as lower longitudinal stability of interindividual differences when compared with the developmental evidence that is available about the life mechanics of cognition. One source of this difference in trajectories may be that for evolutionary reasons children are already further developed with regard to basic emotional and motivational tendencies than in terms of higher cognitive functions. Consequently, we may speculate that following the law of "first in, last out" these basic indicators of emotional and motivational functioning maintain higher levels of functioning until later in life than indicators of the cognitive mechanics. Such an interpretation would make it understandable why many personality mechanisms are well-preserved into older ages and only demonstrate decline when the oldest-old are considered.

4. There has been no systematic work as of yet on the interaction between the life mechanics and pragmatics of personality. Also our knowledge about the links between the neurophysiological and the behavioral level are still at the beginning. Thus, our insight into the functional relations between the life mechanics and pragmatics in that regard is rather limited. Nevertheless, the limited evidence available foreshadows the rich and complex interactions taking place along the continuum between the life mechanics and pragmatics of personality. The picture is further complicated by the special role of the self in the development of the mechanics and pragmatics of life. The self is not merely a developing element in this system, but also has an orchestrating function, coordinating cognitive, emotional, and motivational development. When it comes to life as a whole, the self can be postulated to play a central role in organizing our actions and thoughts, but we need to recognize that at least the consciously agentic self is but part of organizing behaviors.

5. Against this background, we suggest that in the domain of the personality system, developmental increases and stability dynamics extend over longer time spans than is true for the domain of cognition qua cognition. In fact, we have argued that the losses and stressors of adult life may even result in advances regarding the acquisition and refinement of self-regulatory skills. Still, when studying the resilience of the aging self, we also need to take into consideration

whether the underlying physiological and neurological systems have a debilitating and/or facilitating influence on self and personality functioning. The less positive evidence on personality functioning in the oldest old supports this conjecture.

6. Personality as a dynamic system composed of various components with different properties holds a domain-general potential for the transactional adaptation of the developing organism. We argued and presented evidence that personality serves an executive or orchestrating function with regard to the management of gains and losses during ontogeny. Personality possesses a great ability to negotiate the opportunities and constraints of development that come with age, historical, and idiosyncratic conditions. What we have called general-purpose mechanisms play a central role in this adaptational process. Besides protective personality structure and content, it is primarily the availability of a rich variety of self-regulatory mechanisms, and of an adaptive algorithm which monitors their application, that contribute to the adaptational power of personality. Table 11.6 summarizes these protective features in more detail. This adaptive potential reaches its limits in very old age when, due to biological processes, the functional losses may for more and more persons reach an overwhelming degree or at earlier ages when other extreme life circumstances result in an imbalance of gains and losses.

TABLE 11.6 Summary of Protective and Optimizing Characteristics of Self and Personality

Self and Personality Components	Protective and Optimizing Characteristics (Examples)
Personality	Conscientiousness, extraversion, openness to experience, behavioral flexibility, ego resilience, advanced ego level, and cognitive investment
Self-concept	Interrelated, well-articulated variety of self-conceptions and life priorities
	Positive agency (efficacy) beliefs
Self-regulatory and life-management mechanisms	
–Self-evaluation	Application of a functional type of comparison (up, down, lateral, temporal) at the appropriate time in the adaptational process
–Goal setting and restructuring	Selection and reorganization of life priorities
–Coping styles	Intraindividual variability and flexibility in coping styles and compensatory strategies
	Flexibility in adapting goals to circumstances
–Systemic processes	Selective optimization with compensation (SOC)

7. The systemic and overall developmental theory of selective optimization with compensation introduced in the first part of this chapter serves as a useful theoretical tool when analyzing the adaptive potential of the self and personality (P. B. Baltes & Baltes, 1990b). When orchestrating the optimization of development by processes such as selection and compensation, the appraisal of resources is of central importance. Questions such as how to evolve a goal structure and the associated goal-relevant means and motivational investment strategies, how to deal with selection-related disengagements from other possible goals, when to accept a loss and reorient one's life, and when to still strive harder because current behavior is not yet employed to its fullest capability become crucial in composing life development. Brim has argued, for example, that one criterion for making this decision could be to consider something like a "performance/capacity ratio" (Brim, 1992). According to this ratio, acceptance of a certain loss becomes necessary when the display of the behavior requires a "dysfunctionally" high amount of reserve capacity.

CONCLUDING COMMENTARY

The purpose of this chapter was to present life span developmental psychology as a theoretical orientation to the study of human development. Because the dominant theoretical approaches in developmental psychology have been formed primarily by research on infants, children, and adolescents, we made special efforts to highlight the uniqueness in developmental theory that emanates from a life span developmental framework. An unfortunate by-product of this strategy of presentation may have been the relative inattention paid to important commonalities between age-specialized developmental theories and theoretical efforts in life span work.

There is a larger (and growing) commonality in theoretical approach between more age-specialized developmental theories and life span developmental theory than might appear to be true based on the arguments presented in this chapter. In part, this is true because there are several new sources (only alluded to in this chapter) from which innovative theoretical efforts in various quarters of developmental psychology have emerged and which contain a structure of arguments similar to

those put forward in the short history of life span developmental theory. Work in cultural psychology, dynamic systems theory, and on other forms of self-organization in ontogenesis, are examples of this new theoretical treatment of ontogenesis that is beginning to pervade the developmental field as a whole.

As was true for life span psychology and the benefits it derived from its contact with the biology of aging, these new kinds of theoretical treatments have benefited from transdisciplinary dialogue, especially with modern developmental biologists but also anthropologists. Biologists have perhaps led the way in moving research away from unilinear, organismic, and deterministic models of ontogenesis to a theoretical framework that highlights the contextual, adaptive, probabilistic, and self-organizational dynamic aspects of ontogenesis (P. B. Baltes & Graf, 1996; Magnusson, 1996). Similarly, cultural psychologists and anthropologists (e.g., Cole, 1996; Durham, 1991; Valsiner & Lawrence, 1997) have succeeded equally in convincingly demonstrating that human ontogenesis is not only strongly conditioned by culture, but that the architecture of human development is essentially incomplete as to the culturally engineered pathways and possible endpoints (P. B. Baltes, 1997).

Not the least because of this transdisciplinary dialogue, a new conception has emerged regarding the "nature" (Kagan, 1984) of human development. In the modern context, the nature of human development no longer refers to the fixed-biological (P. B. Baltes, 1991; R. M. Lerner, 1984; Magnusson, 1996). Rather, in modern versions of ontogenesis, its nature is both biological and cultural, and both of these categories are subject to dynamic and interactive changes as well as systemic transformations. Of all developmental specialties, life span development, because of its intimate connection with long-term processes of individual development, cultural evolution, and generational transmission is perhaps the field most dependent on, and committed to, such views (e.g., P. B. Baltes, Reuter-Lorenz, & Rösler, 2006; P. B. Baltes & Smith, 2004; S.-C. Li, 2003). Most recently, the emergence of the concept of biocultural co-constructionsim is another justification of this orientation.

The future of life span developmental theory will depend significantly on the extent to which the metatheoretical perspectives advanced turn out to be useful in the conduct of empirical inquiry. On this score, the 1980s have witnessed impressive growth. In the area of intellectual development (see following), for instance, we now have available a cohort- and age-sequential study that extends over close to 50 years (Schaie, 2005) and demonstrates the varied conditions and outcomes which we can observe when placing adult development into the context of historical change and, in addition, consider processes of individual differentiation. There also have been advances in demonstrating the usefulness of the life span approach for other specialties such as clinical (Staudinger et al., 1995; Vaillant, 1990) and applied psychology (Abraham & Hansson, 1995; B. B. Baltes & Dickson, 2001; Sterns & Dorsett, 1994). In fact, these intersects of the life span approach to the study of human development with other psychological specialties need to be identified and nurtured.

Close to 25 years ago, one of us wrote: "There can be no strong field of life span developmental psychology without a solid foundation in and connection to childhood. By the same token, the study of child development does not exist in a vacuum, but is vitally enriched by considering the aftermath of childhood" (P. B. Baltes, 1979b, p. 1). Since then, there has been much progress in elaborating this reciprocal connection between age-focused developmental specialities and their integration into a life span view of human development, but at the same time, this challenge continues to be with us.

REFERENCES

Abraham, J. D., & Hansson, R. O. (1995). Successful aging at work: An applied study of selection, optimization, and compensation through impression management. *Journal of Gerontology: Psychological Sciences, 50B,* 94–103.

Ackerman, P. L. (1996). A theory of adult intellectual development: Process, personality, interests, and knowledge. *Intelligence, 22,* 227–257.

Ackerman, P. L., Beier, M. E., & Bowen, K. R. (2000). Explorations of crystallized intelligence. *Learning and Individual Differences, 12*(1), 105.

Ackerman, P. L., & Cianciolo, A. T. (2000). Cognitive, perceptual-speed, and psychomotor determinants of individual differences during skill acquisition. *Journal of Experimental Psychology: Applied, 6,* 259–290.

Aldwin, C. M., & Revenson, T. A. (1987). Does coping help? A reexamination of the relation between coping and mental health. *Journal of Personality and Social Psychology, 53,* 337–348.

Aldwin, C. M., Sutton, K. J., Chiara, G., & Spiro, A., III. (1996). Age differences in stress, coping, and appraisal: Findings from the Normative Aging Study. *Journal of Gerontology: Psychological Sciences, 51B,* 179–188.

Aldwin, C. M., Sutton, K. J., & Lachman, M. (1996). The development of coping resources in adulthood. *Journal of Personality, 64,* 837–871.

Anokhin, A. P., Müller, V., Lindenberger, U., & Heath, A. C. (in press). Genetic influences on dynamic complexity of brain oscillations. *Neuroscience Letters.*

Ardelt, M. (2004). Wisdom as expert knowledge system: A critical review of a contemporary operationalization of an ancient concept. *Human Development, 47,* 257–285.

Aspinwall, L. G., & Staudinger, U. M. (2003). A psychology of human strengths: Some central issues of an emerging field. In L. G. Aspinwall & U. M. Staudinger (Eds.), *A psychology of human strengths* (pp. 9–22). Washington, DC: American Psychological Association.

Axelrod, R. (1984). *The evolution of cooperation.* New York: Basic Books.

Bäckman, L., & Dixon, R. A. (1992). Psychological compensation: A theoretical framework. *Psychological Bulletin, 112,* 1–25.

Bäckman, L., & Farde, L. (2004). The role of dopamine systems in cognitive aging. In R. Cabeza, L. Nyberg, & D. Park (Eds.), *Cognitive neuroscience of aging: Linking cognitive and cerebral aging.* New York: Oxford University Press.

Bäckman, L., Josephsson, S., Herlitz, A., Stigsdotter, A., & Viitanen, M. (1991). The generalizability of training gains in dementia: Effects of an imagery-based mnemonic on face-name retention duration. *Psychology and Aging, 6,* 489–492.

Baddeley, A. D. (2000). The episodic buffer: A new component of working memory? *Trends in Cognitive Science, 4,* 417–423.

Baltes, B. B., & Dickson, M. W. (2001). Using life-span models in industrial-organizational psychology: The Theory of Selective Optimization with Compensation. *Applied Developmental Science, 5,* 51–61.

Baltes, B. B., & Heydens-Gahir, H. A. (2003). Reduction of work-family conflict through the use of selection, optimization, and compensation behaviors. *Journal of Applied Psychology, 88,* 1005–1018.

Baltes, M. M. (1987). Erfolgreiches altern als ausdruck von verhaltenskompetenz und umweltqualität. In C. Niemitz (Ed.), *Der mensch im zusammenspiel von anlage und umwelt* (pp. 353–377). Frankfurt-am-Main, Germany: Suhrkamp.

Baltes, M. M. (1988). The etiology and maintenance of dependency in the elderly: Three phases of operant research. *Behavior Therapy, 19,* 301–319.

Baltes, M. M. (1995). Dependency in old age: Gains and losses. *Current Directions in Psychological Science, 4,* 14–19.

Baltes, M. M. (1996). *The many faces of dependency in old age.* New York: Cambridge University Press.

Baltes, M. M., & Baltes, P. B. (Eds.). (1986). *The psychology of control and aging.* Hillsdale, NJ: Erlbaum.

Baltes, M. M., & Carstensen, L. L. (1996). The process of successful ageing. *Aging and Society, 16,* 397–422.

Baltes, M. M., & Carstensen, L. L. (1999). Social psychological theories and their applications to aging: From individual to collective social psychology. In V. L. Bengtson & K. W. Schaie (Eds.), *Handbook of theories of aging* (pp. 209–226). New York: Springer.

Baltes, M. M., Kühl, K.-P., Gutzmann, H., & Sowarka, D. (1995). Potential of cognitive plasticity as a diagnostic instrument: A cross-validation and extension. *Psychology and Aging, 10,* 167–172.

Baltes, M. M., Kühl, K.-P., & Sowarka, D. (1992). Testing the limits of cognitive reserve capacity: A promising strategy for early diagnosis of dementia? *Journal of Gerontology: Psychological Sciences, 47,* 165–167.

Baltes, M. M., & Lang, F. R. (1997). Everyday functioning and successful aging: The impact of resources. *Psychology and Aging, 12,* 433–443.

Baltes, M. M., Neumann, E.-M., & Zank, S. (1994). Maintenance and rehabilitation of independence in old age: An intervention program for staff. *Psychology and Aging, 9,* 179–188.

Baltes, M. M., & Silverberg, S. B. (1994). The dynamics between dependency and autonomy: Illustrations across the life span. In D. L. Featherman, R. M. Lerner, & M. Perlmutter (Eds.), *Life span development and behavior* (Vol. 12, pp. 41–90). Hillsdale, NJ: Erlbaum.

Baltes, M. M., & Wahl, H.-W. (1992). The dependency-support script in institutions: Generalization to community settings. *Psychology and Aging, 7,* 409–418.

Baltes, P. B. (1968). Longitudinal and cross-sectional sequences in the study of age and generation effects. *Human Development, 11,* 145–171.

Baltes, P. B. (1973). Life span models of psychological aging: A white elephant? *Gerontologist, 13,* 457–512.

Baltes, P. B. (Ed.). (1976). Symposium on implications of life span developmental psychology for child development. *Advances in Child Development and Behavior, 11,* 167–265.

Baltes, P. B. (1979a). Life span developmental psychology: Some converging observations on history and theory. In P. B. Baltes & O. G. Brim Jr. (Eds.), *Life span development and behavior* (Vol. 2, pp. 255–279). New York: Academic Press.

Baltes, P. B. (1979b, Summer). On the potential and limits of child development: Life span developmental perspectives. *Newsletter of Society for Research in Child Development,* 1–4.

Baltes, P. B. (1983). Life span developmental psychology: Observations on history and theory revisited. In R. M. Lerner (Ed.), *Developmental psychology: Historical and philosophical perspectives* (pp. 79–111). Hillsdale, NJ: Erlbaum.

Baltes, P. B. (1984). Intelligenz im alter [Intelligence in old age]. *Spektrum der Wissenschaft, 5,* 46–60.

Baltes, P. B. (1987). Theoretical propositions of life span developmental psychology: On the dynamics between growth and decline. *Developmental Psychology, 23,* 611–626.

Baltes, P. B. (1991). The many faces of human aging: Toward a psychological culture of old age. *Psychological Medicine, 21,* 837–854.

Baltes, P. B. (1993). The aging mind: Potential and limits. *Gerontologist, 33,* 580–594.

Baltes, P. B. (1997). On the incomplete architecture of human ontogeny: Selection, optimization, and compensation as foundation of developmental theory. *American Psychologist, 52,* 366–380.

Baltes, P. B. (Guest Ed.). (2005). Theoretical approaches to life span development: Interdisciplinary perspectives [Special issue]. *Research in Human Development, 2*(1/2).

Baltes, P. B., & Baltes, M. M. (1980). Plasticity and variability in psychological aging: Methodological and theoretical issues. In G. E. Gurski (Ed.), *Determining the effects of aging on the central nervous system* (pp. 41–66). Berlin, Germany: Schering.

Baltes, P. B., & Baltes, M. M. (1990a). Psychological perspectives on successful aging: The model of selective optimization with compensation. In P. B. Baltes & M. M. Baltes (Eds.), *Successful aging: Perspectives from the behavioral sciences* (pp. 1–34). New York: Cambridge University Press.

Baltes, P. B., & Baltes, M. M. (Eds.). (1990b). *Successful aging: Perspectives from the behavioral sciences.* New York: Cambridge University Press.

Baltes, P. B., Cornelius, S. W., & Nesselroade, J. R. (1979). Cohort effects in developmental psychology. In J. R. Nesselroade & P. B.

Baltes (Eds.), *Longitudinal research in the study of behavior and development* (pp. 61–87). New York: Academic Press.

Baltes, P. B., Dittmann-Kohli, F., & Dixon, R. A. (1984). New perspectives on the development of intelligence in adulthood: Toward a dual-process conception and a model of selective optimization with compensation. In P. B. Baltes & O. G. Brim Jr. (Eds.), *Life span development and behavior* (Vol. 6, pp. 33–76). New York: Academic Press.

Baltes, P. B., Freund, A. M., & Li, S.-C. (2005). The psychological science of human aging. In M. Johnson, V. L. Bengston, P. G. Coleman, & T. Kirkwood (Eds.), *Cambridge handbook of age and aging*. Cambridge, England: Cambridge University Press.

Baltes, P. B., & Goulet, L. R. (1970). Status and issues of a life span developmental psychology. In L. R. Goulet & P. B. Baltes (Eds.), *Life span developmental psychology: Research and theory* (pp. 4–21). New York: Academic Press.

Baltes, P. B., & Goulet, L. R. (1971). Exploration of developmental variables by manipulation and simulation of age differences in behavior. *Human Development, 14,* 149–170.

Baltes, P. B., & Graf, P. (1996). Psychological aspects of aging: Facts and frontiers. In D. Magnusson (Ed.), *The life span development of individuals: Behavioural, neurobiological and psychosocial perspectives* (pp. 427–459). Cambridge, England: Cambridge University Press.

Baltes, P. B., & Kliegl, R. (1992). Further testing of limits of cognitive plasticity: Negative age differences in a mnemonic skill are robust. *Developmental Psychology, 28,* 121–125.

Baltes, P. B., & Kunzmann, U. (2003). Wisdom. *Psychologist, 16,* 131–133.

Baltes, P. B., & Kunzmann, U. (2004). The two faces of wisdom: Wisdom as a general theory of knowledge and judgment about excellence in mind and virtue versus wisdom as everyday realization in people and products. *Human Development, 47,* 290–299.

Baltes, P. B., & Labouvie, G. V. (1973). Adult development of intellectual performance: Description, explanation, modification. In C. Eisdorfer & M. P. Lawton (Eds.), *The psychology of adult development and aging* (pp. 157–219). Washington, DC: American Psychological Association.

Baltes, P. B., & Lindenberger, U. (1988). On the range of cognitive plasticity in old age as a function of experience: 15 years of intervention research. *Behavior Therapy, 19,* 283–300.

Baltes, P. B., & Lindenberger, U. (1997). Emergence of a powerful connection between sensory and cognitive functions across the adult life span: A new window at the study of cognitive aging? *Psychology and Aging, 12,* 12–21.

Baltes, P. B., Lindenberger, U., & Staudinger, U. M. (1998). Life span theory in developmental psychology. In W. Damon (Editor-in-Chief) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 1029–1143). New York: Wiley.

Baltes, P. B., & Mayer, K. U. (Eds.). (1999). *The Berlin Aging Study: Aging from 70 to 100.* New York: Cambridge University Press.

Baltes, P. B., Mayer, K. U., Helmchen, H., & Steinhagen-Thiessen, E. (1993). The Berlin Aging Study (BASE): Overview and design. *Ageing and Society, 13,* 483–515.

Baltes, P. B., & Nesselroade, J. R. (1978). Multivariate antecedents of structural change in adulthood. *Multivariate Behavioral Research, 13,* 127–152.

Baltes, P. B., & Nesselroade, J. R. (1984). Paradigm lost and paradigm regained: Critique of Dannefer's portrayal of life span developmental psychology. *American Sociological Review, 49,* 841–846.

Baltes, P. B., Reese, H. W., & Lipsitt, L. P. (1980). Life span developmental psychology. *Annual Review of Psychology, 31,* 65–110.

Baltes, P. B., Reese, H. W., & Nesselroade, J. R. (1977). *Life span developmental psychology: Introduction to research methods.* Monterey, CA: Brooks/Cole.

Baltes, P. B., Reese, H. W., & Nesselroade, J. R. (1988). *Life span developmental psychology: Introduction to research methods.* Hillsdale, NJ: Erlbaum. (Original work published 1977)

Baltes, P. B., Rösler, F., & Reuter-Lorenz, P. A. (2006). Prologue: The perspective of biocultural co-constructivism. In P. B. Baltes, P. A. Reuter-Lorenz, & F. Rösler (Eds.), *Lifespan development and the brain: The perspective of biocultural co-constructivism* (pp. 3–39). Cambridge, England: Cambridge University Press.

Baltes, P. B., Reuter-Lorenz, P., & Rosler, F. (Eds.). (2006). *Lifespan development and the brain: The perspective of biocultural co-constructivism.* Cambridge, England: Cambridge University Press.

Baltes, P. B., & Schaie, K. W. (1976). On the plasticity of intelligence in adulthood and old age: Where Horn and Donaldson fail. *American Psychologist, 31,* 720–725.

Baltes, P. B., & Singer, T. (2001). Plasticity and the ageing mind: An exemplar of the biocultural orchestration of brain and behaviour. *European Review: Interdisciplinary Journal of the Academia Europaea, 9,* 59–76.

Baltes, P. B., & Smith, J. (1990). The psychology of wisdom and its ontogenesis. In R. J. Sternberg (Ed.), *Wisdom: Its nature, origins, and development* (pp. 87–120). New York: Cambridge University Press.

Baltes, P. B., & Smith, J. (2003). New frontiers in the future of aging: From successful aging of the young old to the dilemmas of the fourth age. *Gerontology, 49,* 123–135.

Baltes, P. B., & Smith, J. (2004). Life span psychology: From developmental contextualism to developmental biocultural co-constructivism. *Research in Human Development, 1*(3), 123–143.

Baltes, P. B., Smith, J., & Staudinger, U. M. (1992). Wisdom and successful aging. In T. Sonderegger (Ed.), *Nebraska Symposium on Motivation* (Vol. 39, pp. 123–167). Lincoln: University of Nebraska Press.

Baltes, P. B., & Staudinger, U. M. (Eds.). (1996a). *Interactive minds: Life span perspectives on the social foundation of cognition.* New York: Cambridge University Press.

Baltes, P. B., & Staudinger, U. M. (1996b). Interactive minds in a life span perspective: Prologue. In P. B. Baltes & U. M. Staudinger (Eds.), *Interactive minds: Life span perspectives on the social foundation of cognition* (pp. 1–32). New York: Cambridge University Press.

Baltes, P. B., & Staudinger, U. M. (2000). Wisdom: A metaheuristic to orchestrate mind and virtue towards excellence. *American Psychologist, 55,* 122–136.

Baltes, P. B., Staudinger, U. M., & Lindenberger, U. (1999). Life span psychology: Theory and application to intellectual functioning [Review]. *Annual Review of Psychology, 50,* 471–507.

Baltes, P. B., Staudinger, U. M., Maercker, A., & Smith, J. (1995). People nominated as wise: A comparative study of wisdom-related knowledge. *Psychology and Aging, 10,* 155–166.

Baltes, P. B., & Willis, S. L. (1982). Plasticity and enhancement of intellectual functioning in old age: Penn State's Adult Development and Enrichment Project ADEPT. In F. I. M. Craik & S. E. Trehub (Eds.), *Aging and cognitive processes* (pp. 353–389). New York: Plenum Press.

Baltes, P. B., & Willis, S. W. (1977). Toward psychological theories of aging and development. In J. E. Birren & K. W. Schaie (Eds.),

Handbook of the psychology of aging (pp. 128–154). New York: Van Nostrand Reinhold.

Baltissen, R. (2005). Psychophysiologische aspekte des mittleren und höheren erwachsenenalters [Psychophysiological aspects of middle and older age]. In S. H. Filipp & U. M. Staudinger (Eds.), *Entwicklungspsychologie des mittleren und höheren erwachsenalters: Enzyklopädie der psychologie* [Developmental psychology of the middle and older age] (pp. 123–173). Göttingen, Germany: Hogrefe.

Bandura, A. (1982). Self-efficacy mechanism in human agency. *American Psychologist, 37,* 122–147.

Bandura, A. (1984). Representing personal determinants in causal structures. *Psychological Review, 91,* 508–511.

Bandura, A. (1993). Perceived self-efficacy in cognitive development and functioning. *Educational Psychologist, 28,* 117–148.

Bandura, A. (1997). *Self-efficacy: The exercise of control.* New York: Freeman.

Bandura, A., & Cervone, D. (1983). Self-evaluative and self-efficacy mechanisms governing the motivational effects of goal systems. *Journal of Personality and Social Psychology, 45,* 1017–1028.

Bandura, A., & Walters, R. H. (1963). *Social learning and personality development.* New York: Holt, Rinehart and Winston.

Barkow, J. H., Cosmides, L., & Tooby, J. (1992). *The adapted mind: Evolutionary psychology and the generation of culture.* New York: Oxford University Press.

Barton, S. (1994). Chaos, self-organization, and psychology. *American Psychologist, 49,* 5–14.

Bashore, T. R., Ridderinkhof, K. R., & van der Molen, M. W. (1997). The decline of cognitive processing speed in old age. *Current Directions in Psychological Science, 6,* 163–169.

Basseches, M. (1984). *Dialectical thinking and adult development.* Norwood, NJ: Ablex.

Baumeister, R. F. (1989). The optimal margin of illusion. *Journal of Social and Clinical Psychology, 8,* 176–189.

Baumeister, R. F. (1992). Neglected aspects of self theory: Motivation, interpersonal aspects, culture, escape, and existential value. *Psychological Inquiry, 3,* 21–25.

Bengtson, V. L., Reedy, M. N., & Gordon, C. (1985). Aging and self-conceptions: Personality processes and social contexts. In J. E. Birren & K. W. Schaie (Eds.), *Handbook of the psychology of aging* (2nd ed., pp. 544–593). New York: Van Nostrand Reinhold.

Benson, F. B., Cherny, S. S., Haith, M. M., & Fulker, D. W. (1993). Rapid assessment of infant predictors of adult IQ: Midtwin-midparent analyses. *Developmental Psychology, 29,* 434–447.

Berg, C. A., & Sternberg, R. J. (1985a). A triarchic theory of intellectual development during adulthood. *Developmental Review, 5,* 334–370.

Berg, C. A., & Sternberg, R. J. (1985b). Response to novelty: Continuity versus discontinuity in the developmental course of intelligence. In H. W. Reese (Ed.), *Advances in child development and behavior* (pp. 2–47). New York: Academic Press.

Birren, J. E. (1959). Principles of research on aging. In J. E. Birren (Ed.), *Handbook of aging and the individual: Psychological and biological aspects* (pp. 3–42). Chicago: University of Chicago Press.

Birren, J. E. (1964). *The psychology of aging.* Englewood Cliffs, NJ: Prentice-Hall.

Birren, J. E. (1988). A contribution to the theory of the psychology of aging: As a counterpart of development. In J. E. Birren & V. L. Bengtson (Eds.), *Emergent theories of aging* (pp. 153–176). New York: Springer.

Birren, J. E., & Fisher, L. M. (1995). Aging and speed of behavior: Possible consequences for psychological functioning. *Annual Review of Psychology, 46,* 329–353.

Birren, J. E., & Schaie, K. W. (Eds.). (1996). *Handbook of the psychology of aging* (3rd ed.). San Diego, CA: Academic Press.

Bjorklund, D. F. (1997). The role of immaturity in human development. *Psychological Bulletin, 122,* 153–169.

Blanchard-Fields, F. (1996). Social cognitive development in adulthood and aging. In F. Blanchard-Fields & T. M. Hess (Eds.), *Perspectives on cognitive change in adulthood and aging* (pp. 454–487). New York: McGraw-Hill.

Blanchard-Fields, F., & Norris, L. (1994). Causal attributions from adolescence through adulthood: Age differences, ego level, and generalized response style. *Aging and Cognition, 1,* 67–86.

Block, J. (1971). *Lives through time.* Berkeley, CA: Bancroft Books.

Block, J. (1993). Studying personality the long way. In D. C. Funder, R. D. Parke, C. Tomlinson-Keasey, & K. Widaman (Eds.), *Studying lives through time: Personality and development—APA science volumes* (pp. 9–41). Washington, DC: American Psychological Association.

Block, J. (1995). A contrarian view of the five-factor approach to personality description. *Psychological Bulletin, 117,* 187–215.

Bloom, B. (1985). *Developing talent in young people.* New York: Ballantine Books.

Boesch, E. E. (1997). Boesch and cultural psychology [Special issue]. *Culture and Psychology, 3*(3).

Bornstein, M. H. (1989). Stability in early mental development: From attention and information processing in infancy to language and cognition in childhood. In M. H. Bornstein & N. A. Krasnegor (Eds.), *Stability and continuity in mental development* (pp. 147–170). Hillsdale, NJ: Erlbaum.

Bosman, E. A., & Charness, N. (1996). Age-related differences in skilled performance and skill acquisition. In F. Blanchard-Fields & T. M. Hess (Eds.), *Perspectives on cognitive change in adulthood and aging* (pp. 428–453). New York: McGraw-Hill.

Brandtstädter, J. (1984). Personal and social control over development: Some implications of an action perspective in life span developmental psychology. In P. B. Baltes & O. G. Brim Jr. (Eds.), *Life span development and behavior* (Vol. 6, pp. 1–32). New York: Academic Press.

Brandtstädter, J. (1998). Action perspectives on human development. In W. Damon (Editor-in-Chief) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 807–866). New York: Wiley.

Brandtstädter, J., & Baltes-Götz, B. (1990). Personal control over development and quality of life perspectives in adulthood. In P. B. Baltes & M. M. Baltes (Eds.), *Successful aging: Perspectives from the behavioral sciences* (pp. 197–224). New York: Cambridge University Press.

Brandtstädter, J., & Greve, W. (1994). The aging self: Stabilizing and protective processes. *Developmental Review, 14,* 52–80.

Brandtstädter, J., & Lerner, R. M. (Eds.). (1999). *Action and self development: Theory and research through the life span.* Thousand Oaks, CA: Sage.

Brandtstädter, J., & Renner, G. (1990). Tenacious goal pursuit and flexible goal adjustment: Explication and age-related analysis of assimilative and accommodative models of coping. *Psychology and Aging, 5,* 58–67.

Brandtstädter, J., & Rothermund, K. (1994). Self-perceptions of control in middle and later adulthood: Buffering losses by rescaling goals. *Psychology and Aging, 9,* 265–273.

Brandtstädter, J., & Rothermund, K. (2003). Intentionality and time in human development and aging: Compensation and goal adjustment in changing developmental contexts. In U. M. Staudinger & U. Lindenberger (Eds.), *Understanding human development: Dialogues with life span psychology* (pp. 105–124). Boston: Kluwer Academic.

Brandtstädter, J., & Wentura, D. (1995). Adjustment to shifting possibility frontiers in later life: Complementary adaptive modes. In R. A. Dixon & L. Bäckman (Eds.), *Psychological compensation: Managing losses and promoting gains* (pp. 83–106). Hillsdale, NJ: Erlbaum.

Brandtstädter, J., Wentura, D., & Greve, W. (1993). Adaptive resources of the aging self: Outlines of an emergent perspective. *International Journal of Behavioral Development, 16,* 323–349.

Brandtstädter, J., Wentura, D., & Rothermund, K. (1999). Intentional self-development through adulthood and later life: Tenacious pursuit and flexible adjustment of goals. In J. Brandtstädter & R. M. Lerner (Eds.), *Action and self-development: Theory and research through the life span* (pp. 373–400). Thousand Oaks, CA: Sage.

Brehmer, Y., Li, S.-C., Müller, V., von Oertzen, T., & Lindenberger, U. (2005). *Memory plasticity across the lifespan: Uncovering children's latent potential.* Unpublished manuscript, Max Planck Institute for Human Development, Berlin, Germany.

Brent, S. B. (1978a). Individual specialization, collective adaptation and rate of environmental change. *Human Development, 21,* 21–23.

Brent, S. B. (1978b). Prigogine's model for self-organization in nonequilibrium systems: Its relevance for developmental psychology. *Human Development, 21,* 374–387.

Brim, O. G., Jr. (1976). Life span development of the theory of oneself: Implications for child development. In P. B. Baltes (Ed.), *Advances in Child Development and Behavior, 11,* 242–251.

Brim, O. G., Jr. (1988). Losing and winning: The nature of ambition in everyday life. *Psychology Today, 9,* 48–52.

Brim, O. G., Jr. (1992). *Ambition: How we manage success and failure throughout our lives.* New York: Basic Books.

Brim, O. G., Jr., & Kagan, J. (1980). Constancy and change: A view of the issues. In O. G. Brim Jr. & J. Kagan (Eds.), *Constancy and change in human development* (pp. 1–25). Cambridge, MA: Harvard University Press.

Brim, O. G., Jr., & Ryff, C. D. (1980). On the properties of life events. In P. B. Baltes & O. G. Brim Jr. (Eds.), *Life span development and behavior* (Vol. 3, pp. 367–388). New York: Academic Press.

Brim, O. G., Jr., Ryff, C. D., & Kessler, R. C. (Eds.). (2004). *How healthy are we? A national study of well-being at midlife.* Chicago: Chicago University Press.

Brim, O. G., Jr., & Wheeler, S. (1966). *Socialization after childhood: Two essays.* New York: Wiley.

Bronfenbrenner, U. (1977). Toward an experimental ecology of human development. *American Psychologist, 32,* 513–532.

Bronfenbrenner, U., & Ceci, S. J. (1994). Nature-nuture reconceptualized in developmental perspective: A bioecological model. *Psychological Review, 101,* 568–586.

Brown, A. L. (1982). Learning and development: The problem of compatibility, access, and induction. *Human Development, 25,* 89–115.

Brunstein, J. C. (1993). Personal goals and subjective well-being: A longitudinal study. *Journal of Personality and Social Psychology, 65,* 1061–1070.

Buckner, R. I. (2004). Three principles for cognitive aging research: Multiple causes and sequelae, variance in expression, and the need for integrative theory. In R. Cabeza, L. Nyberg, & D. Park (Eds.), *Cognitive neuroscience of aging: Linking cognitive and cerebral aging.* New York: Oxford University Press.

Bühler, C. (1933). *Der menschliche lebenslauf als psychologisches problem* [The human life course as a psychological problem]. Göttingen, Germany: Hogrefe.

Burgess, R. L., & Molenaar, P. C. M. (1995). Commentary. *Human Development, 38,* 159–164.

Burns, B. D. (2004). The effects of speed on skilled chess performance. *Psychological Science, 7,* 52–55.

Buss, A. H., & Plomin, R. (1984). *A temperament theory of personality development.* New York: Wiley.

Buunk, B. P. (1994). Social comparison processes under stress: Towards an integration of classic and recent perspectives. *European Review of Social Psychology, 5,* 211–241.

Buunk, B. P., & Gibbons, F. X. (1997). *Health, coping, and well-being: Perspectives from social comparison theory.* Mahwah, NJ: Erlbaum.

Cabeza, R. (2002). Hemispheric asymmetry reduction in older adults: The HAROLD model. *Psychology and Aging, 17*(1), 85–100.

Cabeza, R., Daselaar, S. M., Dolcos, F., Prince, S. E., Budde, M., & Nyberg, L. (2004). Task-independent and task-specific age effects on brain activity during working memory, visual attention and episodic retrieval. *Cerebral Cortex, 14,* 364–375.

Cabeza, R., Nyberg, L., & Park, D. (Eds.). (2004). *Cognitive neuroscience of aging: Linking cognitive and cerebral aging.* New York: Oxford University Press.

Campbell, J. D., Assanand, S., & Di Paula, A. (2003). The structure of the self-concept and its relation to psychological adjustment. *Journal of Personality, 71,* 115–140.

Cantor, N., & Blanton, H. (1996). Effortful pursuit of personal goals in daily life. In P. M. Gollwitzer & J. A. Bargh (Eds.), *The psychology of action: Linking cognition and motivation to behavior* (pp. 338–359). New York: Guilford Press.

Cantor, N., & Fleeson, W. (1994). Social intelligence and intelligent goal pursuit: A cognitive slice of motivation. *Nebraska Symposium on Motivation* (Vol. 41, pp. 125–179). Lincoln: University of Nebraska Press.

Cardon, L. R., & Fulker, D. W. (1991). Sources of continuity in infant predictors of later IQ. *Intelligence, 15,* 279–293.

Cardon, L. R., & Fulker, D. W. (1994). A model of developmental change in hierarchical phenotypes with application to specific cognitive abilities. *Behavior Genetics, 24,* 1–16.

Carlson, J. S. (1994). Dynamic assessment of mental abilities. In R. J. Sternberg (Ed.), *Encyclopedia of intelligence* (pp. 368–372). New York: Macmillan.

Carstensen, L. L. (1995). Evidence for a life span theory of socioemotional selectivity. *Current Directions in Psychological Science, 4,* 151–156.

Carstensen, L. L., Isaacowitz, D. M., & Charles, S. T. (1999). Taking time seriously: A theory of socioemotional selectivity. *American Psychologist, 54,* 165–181.

Carus, F. A. (1808). *Psychologie: Zweiter Teil: Specialpsychologie* [Psychology: Pt. 2. Special psychology]. Leipzig, Germany: Barth & Kummer.

Carver, C. S., & Scheier, M. F. (1998). *On the self-regulation of behavior.* New York: Cambridge University Press.

Carver, C. S., & Scheier, M. F. (2003). Three human strengths. In U. M. Staudinger & L. G. Aspinwall (Eds.), *A psychology of human strengths* (pp. 87–102). Washington, DC: American Psychological Association.

Case, R. (1985). *Intellectual development: From birth to adulthood.* New York: Academic Press.

Case, R. (1992). The role of the frontal lobes in the regulation of human development. *Brain and Cognition, 20,* 51–73.

Caspi, A. (1987). Personality in the life course. *Journal of Personality and Social Psychology, 53,* 1203–1213.

Caspi, A. (1998). Personality development across the life course. In W. Damon (Editor-in-Chief) & N. Eisenberg (Vol. Ed.), *Handbook of child psychology: Vol. 3. Social emotional, and personality development* (5th ed., pp. 311–387). New York: Wiley.

Caspi, A., & Bem, D. J. (1990). Personality continuity and change across the life course. In L. A. Pervin (Ed.), *Handbook of personality: Theory and research* (pp. 549–575). New York: Guilford Press.

Caspi, A., & Silva, P. A. (1995). Temperamental qualities at age 3 predict personality traits in young adulthood: Longitudinal evidence from a birth cohort. *Child Development, 66,* 486–498.

Cattell, R. B. (1971). *Abilities: Their structure, growth, and action.* Boston: Houghton Mifflin.

Cerella, J. (1990). Aging and information processing rate. In J. E. Birren & K. W. Schaie (Eds.), *Handbook of the psychology of aging* (pp. 201–221). San Diego, CA: Academic Press.

Chapman, M. (1988a). *Constructive evolution: Origins and development of Piaget's thought.* New York: Cambridge University Press.

Chapman, M. (1988b). Contextuality and directionality of cognitive development. *Human Development, 31,* 92–106.

Chapman, M., & Lindenberger, U. (1992). Transitivity judgments, memory for premises, and models of children's reasoning. *Developmental Review, 12,* 124–163.

Charles, S. T., Reynolds, C. A., & Gatz, M. (2001). Age-related differences and change in positive and negative affect over 23 years. *Journal of Personality and Social Psychology, 80,* 136–151.

Charlesworth, B. (1994). *Evolution in age-structured populations* (2nd ed.). Cambridge: Cambridge University Press.

Charness, N. (1981). Search in chess: Age and skill differences. *Journal of Experimental Psychology: Human Perception and Performance, 7,* 467–476.

Charness, N. (1989). Age and expertise: Responding to Talland's challenge. In L. W. Poon (Ed.), *Everyday cognition in adulthood and late life* (pp. 437–456). Cambridge, England: Cambridge University Press.

Charness, N. (2005). Work/occupation: Macro-structural dimensions of experience and skills training—A developmental perspective. In P. B. Baltes, P. Reuter-Lorenz, & F. Rösler (Eds.), *Life span development and the brain: The perspective of biocultural co-constructivism.* Cambridge, England: Cambridge University Press.

Charness, N. (2006). The influence of work and occupation on brain development. In P. B. Baltes, P. A. Reuter-Lorenz, & F. Rösler (Eds.), *Lifespan development and the brain: The perspective of biocultural co-constructivism* (pp. 306–325). Cambridge, England: Cambridge University Press.

Chess, S., & Thomas, A. (1984). *Origins and evolution of behaviour disorders.* New York: Brunner/Mazel.

Chi, M. T. H., Glaser, R., & Rees, E. (1982). Expertise in problem solving. In R. J. Sternberg (Ed.), *Advances in the psychology of human intelligence* (Vol. 1, pp. 7–75). Hillsdale, NJ: Erlbaum.

Chi, M. T., & Koeske, R. D. (1983). Network representation of a child's dinosaur knowledge. *Developmental Psychology, 19,* 29–39.

Chugani, H. T., Phelps, M. E., & Mazziotta, J. C. (1987). Positron emission tomography study of human brain development. *Annals of Neurology, 22,* 487–497.

Cicchetti, D. (1993). Developmental psychopathology: Reactions, reflections, projections—Setting a path for the coming decade: Some goals and challenges [Special issue]. *Developmental Review, 13,* 471–502.

Cicchetti, D., & Cohen, D. J. (Eds.). (1995). *Developmental psychopathology* (Vols. 1–2). New York: Wiley.

Cicero, M. T. (44в.с./1744). *Cato major: De senectute* [Cato major or His discourse of old age] (J. Logan, Trans.). Philadelphia: Benjamin Franklin.

Cloninger, C. R. (1987). A systematic method of clinical description and classification of personality variants: A proposal. *Archives of General Psychiatry, 44,* 573–588.

Cloninger, C. R. (2003). Completing the psychobiological architecture of human personality development: Temperament, character, and coherence. In U. M. Staudinger & U. Lindenberger (Eds.), *Understanding human development: Dialogues with life span psychology* (pp. 159–181). Boston: Kluwer Academic.

Cohen, S. H., & Reese, H. W. (Eds.). (1994). *Life span developmental psychology: Methodological contributions.* Hillsdale, NJ: Erlbaum.

Colcombe, S. J., Erickson, K. I., Raz, N., Webb, A. G., Cohen, N. J., McAuley, E., et al. (2003). Aerobic fitness reduces brain tissue loss in aging humans. *Journals of Gerontology: Biological Sciences and Medical Sciences, 58*(2, Series A), 176–180.

Cole, M. (1996). Interacting minds in a life span perspective: A cultural/historical approach to culture and cognitive development. In P. B. Baltes & U. M. Staudinger (Eds.), *Interactive minds: Life span perspectives on the social foundation of cognition* (pp. 59–87). New York: Cambridge University Press.

Collins, W. A. (Ed.). (1982). *Minnesota Symposia on Child Psychology: Vol. 15. The concept of development* (pp. 55–81). Hillsdale, NJ: Erlbaum.

Colvin, C. R., & Block, J. (1994). Do positive illusions foster mental health? An examination of the Taylor and Brown formulation. *Psychological Bulletin, 116,* 3–20.

Costa, P.-T., Jr., Herbst, J. H., McCrae, R. R., & Siegler, I. C. (2000). Personality at midlife: Stability, intrinsic maturation, and response to life events. *Assessment, 7,* 365–378.

Costa, P. T., Jr., & McCrae, R. R. (1993). Psychological stress and coping in old age. In L. Goldberger & S. Breznitz (Eds.), *Handbook of stress: Theoretical and clinical aspects* (2nd ed., pp. 403–412). New York: Free Press.

Costa, P. T., & McCrae, R. R. (1994). Set like plaster? Evidence for the stability of adult personality. In T. F. Heatherton & J. L. Weinberger (Eds.), *Can personality change?* (pp. 21–40). Washington, DC: American Psychological Association.

Costa, P. T., Zondermann, A. B., McCrae, R. R., Cornoni-Huntley, J., Locke, B. Z., & Barbano, H. E. (1987). Longitudinal analyses of psychological well-being in a national sample: Stability of mean levels. *Journal of Gerontology, 42,* 50–55.

Cotman, C. W. (Ed.). (1985). *Synaptic plasticity.* New York: Guilford Press.

Cowdry, E. V. (1939). *Problems of ageing: Biological and medical aspects.* Baltimore: Williams & Wilkins.

Craik, F. I. M. (1983). On the transfer of information from temporary to permanent memory. *Philosophical Transactions of the Royal Society of London B, 302,* 341–359.

Craik, F. I. M. (1986). A functional account of age differences in memory. In F. Klix & H. Hagendorf (Eds.), *Human memory and cognitive capabilities, mechanisms, and performance* (pp. 409–422). Amsterdam: North-Holland.

Craik, F. I. M., & Bialystok, E. (Eds.). (2006). *Life span cognition: Mechanisms of change.* Oxford, England: Oxford University Press.

Craik, F. I. M., & Byrd, M. (1982). Aging and cognitive deficits: The role of attentional resources. In F. I. M. Craik & S. Trehub (Eds.), *Aging and cognitive processes* (pp. 191–211). New York: Plenum Press.

Craik, F. I. M., & Salthouse, T. A. (Eds.). (2000). *The handbook of aging and cognition* (2nd ed.). Hillsdale, NJ: Erlbaum.

Damon, W. (1996). The lifelong transformation of moral goals through social influence. In P. B. Baltes & U. M. Staudinger (Eds.), *Interactive minds: Life span perspectives on the social foundation of cognition* (pp. 198–220). New York: Cambridge University Press.

D'Andrade, R. (1995). *The development of cognitive anthropology.* Cambridge, England: Cambridge University Press.

Dannefer, D. (1989). Human action and its place in theories of aging. *Journal of Aging Studies, 3,* 1–20.

Datan, N., & Reese, H. W. (Eds.). (1977). *Life span developmental psychology: Dialectical perspectives on experimental research.* New York: Academic Press.

Davidson, R. J. (1984). Affect, cognition, and hemispheric specialization. In C. E. Izard, J. Kagan, & R. Zajonc (Eds.), *Emotion, cognition, and behavior* (pp. 320–365). New York: Cambridge University Press.

Davidson, R. J., Jackson, D. C., & Kalin, N. H. (2000). Emotion, plasticity, context, and regulation: Perspectives from affective neuroscience. *Psychological Bulletin, 126,* 890–909.

Davidson, R. J., & Rickman, M. (1999). Behavioral inhibition and the emotional circuitry of the brain: Stability and plasticity during the early childhood years. In L. A. Schmidt & J. Schulkin (Eds.), *Extreme fear and shyness: Origins and outcomes* (pp. 67–87). New York: Oxford University Press.

Dawkins, R. (1982). *The extended phenotype: The gene as the unit of selection.* Oxford, England: Oxford University Press.

Deary, I. J., & Pagliari, C. (1991). The strength of g at different levels of ability: Have Detterman and Daniel rediscovered Spearmans law of diminishing returns? *Intelligence, 15,* 251–255.

de Geus, E. J. C., & Boomsma, D. I. (2002). A genetic neuroscience approach to human cognition. *European Psychologist, 6,* 241–253.

DeKay, W. T., & Buss, D. M. (1992). Human nature, individual differences, and the importance of context: Perspectives from evolutionary psychology. *Current Directions in Psychological Science, 1,* 184–189.

Dempster, F. N. (1992). The rise and fall of the inhibitory mechanism: Toward a unified theory of cognitive development and aging. *Developmental Review, 12,* 45–75.

Denney, N. W. (1984). A model of cognitive development across the life span. *Developmental Review, 4,* 171–191.

Depue, R. A., & Collins, P. F. (1999). Neurobiology of the structure of personality: Dopamine, facilitation of incentive motivation, and extraversion. *Behavioral and Brain Sciences, 22,* 491–569.

Depue, R. A., Krauss, S. P., & Spoont, M. R. (1987). A two-dimensional threshold model of seasonal bipolar affective disorder. In D. Magnusson & A. Oehman (Eds.), *Psychopathology: An interactional perspective—Personality, psychopathology, and psychotherapy* (pp. 95–123). Orlando, FL: Academic Press.

Diamond, A. (2002). Normal development of prefrontal cortex from birth to young adulthood: Cognitive functions, anatomy, and biochemistry. In D. T. Stuss & R. T. Kinght (Eds.), *Principles of frontal lobe function* (pp. 466–503). London: Oxford University Press.

Dick, D. M., & Rose, R. J. (2002). Behavior genetics: What's new? What's next? *Current Direction in Psychological Science, 11,* 70–74.

Dickinson, C. M., & Rabbitt, P. M. A. (1991). Simulated visual impairment: Effects on text comprehension and reading speed. *Clinical Vision Sciences, 6,* 301–308.

Diehl, M., Hastings, C. T., & Stanton, J. M. (2001). Self-concept differentiation across the adult life span. *Psychology and Aging, 16,* 643–654.

Diener, E., & Suh, E. (1998). Subjective well-being and age: An international analysis. *Annual Review of Gerontology and Geriatrics, 17,* 304–324.

Dittmann-Kohli, F. (1991). Meaning and personality change from early to late adulthood. *European Journal of Personality, 1,* 98–103.

Dittmann-Kohli, F., Bode, C., & Westerhof, G. J. (2001). Selbst- und lebensvorstellungen in der zweiten lebenshälfte: Ergebnisse aus dem alters-survey. In F. U. J. Bundesministerium für Familie, Senioren (Ed.), *Die zweite lebenshälfte: Psychologische perspektiven—Ergebnisse des alters-survey* (pp. 549–584). Stuttgart, Germany: Kohlhammer.

Dixon, R. A., & Bäckman, L. (Eds.). (1995). *Compensating for psychological deficits and declines: Managing losses and promoting gains.* Mahwah, NJ: Erlbaum.

Dixon, R. A., & Baltes, P. B. (1986). Toward life span research on the functions and pragmatics of intelligence. In R. J. Sternberg & R. K. Wagner (Eds.), *Practical intelligence: Nature and origins of competence in the everyday world* (pp. 203–234). New York: Cambridge University Press.

Dixon, R. A., & Gould, O. N. (1996). Adults telling and retelling stories collaboratively. In P. B. Baltes & U. M. Staudinger (Eds.), *Interactive minds: Life span perspective on the social foundation of cognition* (pp. 221–241). New York: Cambridge University Press.

Dixon, R. A., & Lerner, R. M. (1988). A history of systems in developmental psychology. In M. H. Bornstein & M. E. Lamb (Eds.), *Developmental psychology: An advanced textbook* (2nd ed., pp. 3–50). Hillsdale, NJ: Erlbaum.

Donahue, E. M., Robins, R. W., Roberts, B. W., & John, O. P. (1993). The divided self: Concurrent and longitudinal effects of psychological adjustment and social roles on self-concept differentiation. *Journal of Personality and Social Psychology, 64,* 834–846.

Doussard-Roosevelt, J. A., McClenny, B. D., & Porges, S. W. (2001). Neonatal cardiac vagal tone and school-age development outcome in very low birth weight infants. *Developmental Psychology, 38,* 56–66.

Draganski, B., Gaser, C., Busch, V., Schuierer, G., Bogdahn, U., & May, A. (2004). Changes in gray matter induced by training. *Nature, 427,* 311–312.

Durham, W. H. (1991). *Coevolution: Genes, culture and human diversity.* Stanford, CA: Stanford University Press.

Ebner, N. C., & Freund, A. M. (2003, August). *Win or don't lose: Age differences in personal goal focus.* Poster presented at the 111th Meeting of the American Psychological Association, Toronto, Canada.

Edelman, G. M. (1987). *Neural Darwinism: The theory of neuronal group selection.* New York: Basic Books.

Edelstein, W., & Noam, G. (1982). Regulatory structures of the self and "postformal" stages in adulthood. *Human Development, 6,* 407–422.

Eichorn, D. H., Clausen, J. A., Haan, N., Honzik, M. P., & Mussen, P. H. (Eds.). (1981). *Present and past in middle life.* New York: Academic Press.

Elbert, T., Pantev, C., Wienbruch, C., Rockstroh, B., & Taub, E. (1995). Increased cortical representation of the fingers of the left hand in string players. *Science, 270,* 305–307.

Elbogen, E. B., Carlo, G., & Spaulding, W. (2001). Hierarchical classification and the integration of self-structure in late adolescence. *Journal of Adolescence, 24,* 657–670.

Elder, G. H., Jr. (1974). *Children of the Great Depression.* Chicago: University of Chicago Press.

Elder, G. H., Jr. (Ed.). (1985). *Life course dynamics: Trajectories and transitions 1968–1980.* Ithaca, NY: Cornell University Press.

Elder, G. H., Jr. (1986). Military times and turning points in men's lives. *Developmental Psychology, 22,* 233–245.

Elder, G. H., Jr. (1990). Studying lives in a changing society: Sociological and personological explorations. In A. Rabin, R. Zucker, R. Emmons, & S. Frank (Eds.), *Studying persons and lives* (pp. 201–247). New York: Springer.

Elder, G. H., Jr. (1994). Time, human agency, and social change: Perspectives on the life course. *Social Psychology Quarterly, 57,* 4–15.

Elliot, A. J., Sheldon, K. M., & Church, M. A. (1997). Avoidance personal goals and subjective well-being. *Personality and Social Psychology Bulletin, 23*(9), 915–927.

Elman, J. L., Bates, E. A., Johnson, M. H., Karmiloff-Smith, A., Parisi, D., & Plunkett, K. (1996). *Rethinking innateness: A connectionist perspective on development.* Cambridge, MA: MIT Press.

Emmons, R. A. (1996). Striving and feeling: Personal goals and subjective well-being. In P. M. Gollwitzer & J. A. Bargh (Eds.), *The psychology of action: Linking cognition and motivation to behavior* (pp. 313–337). New York: Guilford Press.

Engle, R. W., Conway, A. R. A., Tuholski, S. W., & Shishler, R. J. (1995). A resource account of inhibition. *Psychological Science, 6,* 122–125.

Engle, R. W., Kane, M. J., & Tuholski, S. W. (1999). Individual differences in working memory capacity and what they tell us about controlled attention, general fluid intelligence, and functions of the prefrontal cortex. In A. Miyake & S. Priti (Eds.), *Models of working memory: Mechanisms of active maintenance and executive control* (pp. 102–134). Cambridge, England: Cambridge University Press.

Ericsson, K. A., Krampe, R. T., & Tesch-Römer, C. (1993). The role of deliberate practice in the acquisition of expert performance. *Psychological Review, 100,* 363–406.

Ericsson, K. A., & Smith, J. (Eds.). (1991). *Towards a general theory of expertise: Prospects and limits.* New York: Cambridge University Press.

Erikson, E. H. (1959). Identity and the life cycle. *Psychological Issues Monograph 1.* New York: International University Press.

Featherman, D. L., & Lerner, R. M. (1985). Ontogenesis and sociogenesis: Problematics for theory and research about development and socialization across the life span. *American Sociological Review, 50,* 659–676.

Featherman, D. L., Smith, J., & Peterson, J. G. (1990). Successful aging in a "post-retired" society. In P. B. Baltes & M. M. Baltes (Eds.), *Successful aging: Perspectives from the behavioral sciences* (pp. 50–93). New York: Cambridge University Press.

Filipp, S.-H. (1996). Motivation and emotion. In J. E. Birren & K. W. Schaie (Eds.), *Handbook of the psychology of aging* (pp. 218–235). San Diego, CA: Academic Press.

Filipp, S.-H. (1999). A three-stage model of coping with loss and trauma: Lessons from patients suffering from severe and chronic disease. In A. Maercker, M. Schützwohl, & Z. Solomon (Eds.), *Posttraumatic stress disorder: A life span developmental perspective* (pp. 43–80). Seattle, WA: Hogrefe & Huber.

Filipp, S.-H., & Buch-Bartos, K. (1994). Vergleichsprozesse und lebenszufriedenheit im alter: Ergebnisse einer pilotstudie [Comparison processes and life satisfaction in old age]. *Zeitschrift für Entwicklungspsychologie und Pädagogische Psychologie, 26,* 22–34.

Filipp, S.-H., & Klauer, T. (1986). Conceptions of self over the life span: Reflections on the dialectics of change. In M. M. Baltes & P. B. Baltes (Eds.), *The psychology of aging and control* (pp. 167–204). Hillsdale, NJ: Erlbaum.

Filipp, S.-H., & Klauer, T. (1991). Subjective well-being in the face of critical life events: The case of successful coping. In F. Strack, M. Argyle, & N. Schwarz (Eds.), *The social psychology of subjective well-being* (Vol. 21, pp. 213–234). Oxford, England: Pergamon Press.

Filipp, S.-H., & Mayer, A. K. (2005). Selbstkonzepentwicklung [Self-concept development]. In J. B. Asendorpf & H. Rauh (Eds.), *Soziale, emotionale und Persönlichkeitsentwicklung: Enzyklopädie der Psychologie* [Social, emotional, and personality development: Encyclopedia of psychology]. Göttingen, Germany: Hogrefe.

Filipp, S.-H., & Staudinger, U. M. (Hrsg.). (2005). *Entwicklungspsychologie des mittleren und hoheren Erwachsenenalters* (Enzyklopädie für Psychologie: Entwicklungspsychologie, Vol. 6). Göttingen: Hogrefe.

Finch, C. E. (1990). *Longevity, senescence, and the genome.* Chicago: University of Chicago Press.

Finch, C. E., & Zelinski, E. M. (2005). Normal aging of brain structure and cognition: Evolutionary perspectives. *Research in Human Development, 2*(1/2), 69–82.

Finkel, D., Pedersen, N. L., McClearn, G. E., Plomin, R., & Berg, S. (1996). Cross-sequential analysis of genetic influences on cognitive ability in the Swedish Adoption/Twin Study of Aging. *Aging, Neuropsychology, and Cognition, 3,* 84–99.

Fisk, J. E., & Warr, P. (1996). Age-related impairment in associative learning: The role of anxiety, arousal, and learning self-efficacy. *Personality and Individual Differences, 21,* 675–686.

Fiske, S. T., & Taylor, S. E. (1991). *Social cognition* (2nd ed.). New York: McGraw-Hill.

Flavell, J. H. (1970). Cognitive changes in adulthood. In L. R. Goulet & P. B. Baltes (Eds.), *Life span developmental psychology: Research and theory* (pp. 247–253). New York: Academic Press.

Flavell, J. H. (1992). Cognitive development: Past, present, and future. *Developmental Psychology, 28,* 998–1005.

Fleeson, W., & Baltes, P. B. (1998). Beyond present-day personality assessment: An encouraging exploration of the measurement properties and predictive power of subjective lifetime personality. *Journal of Research in Personality, 32,* 411–430.

Fleeson, W., & Heckhausen, J. (1997). More or less "me" in past, present, and future: Perceived lifetime personality during adulthood. *Psychology and Aging, 12,* 125–136.

Flynn, J. R. (1987). Massive IQ gains in 14 nations: What IQ tests really measure. *Psychological Bulletin, 101,* 171–191.

Folkman, S., Lazarus, R. S., Pimley, S., & Novacek, J. (1987). Age differences in stress and coping processes. *Psychology and Aging, 2,* 171–184.

Folkow, B., & Svanborg, A. (1993). Physiology of cardiovascular aging. *Psysiological Reviews, 73,* 725–764.

Ford, D. H., & Lerner, R. M. (1992). *Developmental systems theory: An integrative approach.* London: Sage.

Forster, J. M., & Gallagher, D. (1986). An exploratory study comparing depressed and nondepressed elders coping strategies. *Journals of Gerontology, 41,* 91–93.

Fox, P. W., Hershberger, S. L., & Bouchard, T. J. (1996). Genetic and environmental contributions to the acquisition of a motor skill. *Nature, 384,* 356–358.

Frazier, L. D., Hooker, K., Johnson, P. M., & Klaus, C. R. (2000). Continuity and change in possible selves in later life: A 5-year longitudinal study. *Basic and Applied Social Psychology, 22,* 237–243.

Fredrickson, B. L., & Levenson, R. W. (1998). Positive emotions speed recovery from the cardiovascular sequelae of negative emotions. *Cognition and Emotion, 12,* 191–220.

Freund, A. (1995). *Wer bin ich? Die sebstdefinition alter menschen* [Who am I? The self-definition of older people]. Berlin, Germany: Sigma.

Freund, A. M. (2002). Selection, optimization, and compensation. In D. J. Ekerdt, R. A. Applebaum, K. C. Holden, S. G. Post, K. Rockwood, R. Schulz, et al. (Eds.), *Encyclopedia of aging* (Vol. 4, pp. 1257–1260). New York: Macmillan.

Freund, A. M. (in press). Differential motivational consequences of goal focus in younger and older adults. *Psychology and Aging.*

Freund, A. M., & Baltes, P. B. (1998). Selection, optimization, and compensation as strategies of life-management: Correlations with subjective indicators of successful aging. *Psychology and Aging, 13,* 531–543.

Freund, A. M., & Baltes, P. B. (2000). The orchestration of selection, optimization, and compensation: An action-theoretical conceptualization of a theory of developmental regulation. In W. J. Perrig & A. Grob (Eds.), *Control of human behavior, mental processes, and consciousness* (pp. 35–58). Mahwah, NJ: Erlbaum.

Freund, A. M., & Baltes, P. B. (2002a). The adaptiveness of selection, optimization, and compensation as strategies of life management: Evidence from a preference study on proverbs. *Journal of Gerontology: Psychological Sciences, 57B,* 426–434.

Freund, A. M., & Baltes, P. B. (2002b). Life-management strategies of selection, optimization, and compensation: Measurement by self-report and construct validity. *Journal of Personality and Social Psychology, 82,* 642–662.

Freund, A. M., & Ebner, N. C. (2005). The aging self: Shifting from promoting gains to balancing losses. In W. Greve, K. Rothermund, & D. Wentura (Eds.), *The adaptive self: Personal continuity and intentional self-development* (pp. 185–202). New York: Hogrefe.

Freund, A. M., & Smith, J. (1999). Content and function of the self-definition in old and very old age. *Journal of Gerontology: Psychological Sciences,* 55–67.

Frey, K. S., & Ruble, D. N. (1990). Strategies for comparative evaluation: Maintaining a sense of competence across the life span. In R. J. Sternberg & J. John Kolligian (Eds.), *Competence considered* (pp. 167–189). New Haven, CT: Yale University Press.

Friedman, H. S., Tucker, J. S., Schwartz, J. E., Tomlinson-Keasey, C., Martin, L. R., Wingard, D. L., et al. (1995). Psychosocial and behavioral predictors of longevity: The aging and death of the "Termites." *American Psychologist, 50,* 69–78.

Friedman, H. S., Tucker, J. S., Tomlinson-Keasey, C., Schwartz, J. E., Wingard, D. L., & Criqui, M. H. (1993). Does childhood personality predict longevity? *Journal of Personality and Social Psychology, 65,* 176–185.

Fries, J. F., & Crapo, L. M. (1981). *Vitality and aging.* San Francisco: Freeman.

Funder, D. C. (2001). Personality. *Annual Review of Psychology, 52,* 197–221.

Garmezy, N. (1991). Resilience in children's adaptation to negative life events and stressed environments. *Pediatric Annals, 20,* 459–466.

Garrett, H. E. (1946). A developmental theory of intelligence. *American Psychologist, 1,* 372–378.

Gehlen, A. (1956). *Urmensch und Spätkultur.* Bonn, Germany: Athenäum.

George, L. K., & Okun, M. A. (1985). Self-concept content. In E. Palmore, E. W. Busse, G. L.

Ghisletta, P., & Lindenberger, U. (2005). Exploring structural dynamics within and between sensory and intellectual functioning in old and very old age: Longitudinal evidence from the Berlin Aging Study. *Intelligence, 33,* 555–587.

Gigerenzer, G. (1996). Rationality: Why social context matters. In P. B. Baltes & U. M. Staudinger (Eds.), *Interactive minds: Life span perspectives on the social foundation of cognition* (pp. 317–346). New York: Cambridge University Press.

Gigerenzer, G. (2003). The adaptive toolbox and life span development: Common questions. In U. M. Staudinger & U. Lindenberger (Eds.), *Understanding human development: Dialogues with life span psychology* (pp. 423–435). Boston: Kluwer Academic.

Gigerenzer, G., & Todd, P. M. (Eds.). (1999). *Simple heuristics that make us smart.* Oxford University Press.

Gignac, M. A. M., Cott, C., & Badley, E. M. (2002). Adaptation to disability: Applying selective optimization with compensation to the behaviors of older adults with osteoarthritis. *Psychology and Aging, 17,* 520–524.

Gobet, F., Lane, P. C. R., Croker, S., Cheng, P. C.-H., Jones, G., Oliver, I., et al. (2001). Chunking mechanisms in human learning. *Trends in Cognitive Neuroscience, 6*(6), 236–243.

Goldberg, L. R. (1993). "The structure of phenotypic personality traits": Author's reactions to the six comments. *American Psychologist, 48,* 1303–1304.

Goldberg, T. E., & Weinberger, D. R. (2004). Genes and the parsing of cognitive processes. *Trends in Cognitive Sciences, 8,* 325–335.

Gollwitzer, P. M., & Bargh, J. A. (Eds.). (1996). *The psychology of action: Linking cognition and motivation to action.* New York: Guilford Press.

Gottlieb, G. (1998). Normally occurring environmental and behavioral influences on gene activity: From central dogma to probalistic epigenesis. *Psychological Review, 105,* 792–802.

Gould, S. J. (1984). Relationship of individual and group change: Ontogeny and phylogeny in biology. *Human Development, 27,* 233–239.

Gould, S. J., & Vrba, E. S. (1982). Exaptation—A missing term in the science of form. *Paleobiology, 8,* 4–15.

Goulet, L. R., & Baltes, P. B. (Eds.). (1970). *Life span developmental psychology: Research and theory.* New York: Academic Press.

Gray, J. A. (1981). A critique of Eysenck's theory of personality. In H. J. Eysenck (Ed.), *A model of personality* (pp. 246–276). Berlin, Germany: Springer-Verlag.

Greenwald, A. G., & Pratkanis, A. R. (1984). The self. In R. S. Wyer & T. K. Srull (Eds.), *Handbook of social cognition* (Vol. 3, pp. 129–178). Hillsdale, NJ: Erlbaum.

Greve, W., & Staudinger, U. M. (in press). Resilience in later adulthood and old age: Resources and potentials for successful aging. To appear in D. Cicchetti & A. Cohen (Eds.), *Developmental Psychopathology* (2nd ed.).

Greve, W., & Wentura, D. (2003). Immunizing the self: Self-concept stabilization through reality-adaptive self-definitions. *Personality and Social Psychology Bulletin, 29,* 39–50.

Grimm, J. (1860). Rede über das alter. In *Kleinere Schriften von Jacob Grimm* (Vol. 1, pp. 188–210). Berlin, Germany: Harrwitz und Grossmann.

Groffmann, K. I. (1970). Life span developmental psychology in Europe. In L. R. Goulet & P. B. Baltes (Eds.), *Life span developmental psychology: Research and theory* (pp. 54–68). New York: Academic Press.

Gross, J. J., Carstensen, L. L., Pasupathi, M., Tsai, J., Skorpen, C. G., & Hsu, A. Y. C. (1997). Emotion and aging: Experience, expression, and control. *Psychology and Aging, 12,* 590–599.

Güntürkün, O. (2006). Epilogue: Letters on nature and nurture. In P. B. Baltes, P. Reuter-Lorenz, & F. Rösler (Eds.), *Lifespan development and the brain: The perspective of biocultural coconstructivism* (pp. 379–397). Cambridge, England: Cambridge University Press.

Guthke, J., & Wiedl, K. H. (Eds.). (1996). *Dynamisches Testen.* Göttingen, Germany: Hogrefe.

Hagen, E. H., & Hammerstein, P. (2005). Evolutionary biology and the strategic view of ontogeny: Genetic strategies provide robustness and flexibility in the life course. *Research in Human Development, 2*(1/2), 83–97.

Hale, S. (1990). A global developmental trend in cognitive processing speed. *Child Development, 61,* 653–663.

Halford, G. S. (1993). *Children's understanding: The development of mental models.* Hillsdale, NJ: Erlbaum.

Hall, G. S. (1922). *Senescence: The last half of life.* New York: Appleton.

Hambrick, D. Z., & Engle, R. W. (2002). Effects of domain knowledge, working memory capacity, and age on cognitive performance: An investigation of the knowledge-is-power hypothesis. *Cognitive Psychology, 44,* 339–387.

Hamer, D., & Copeland, P. (1998). *Living with our genes.* New York: Doubleday.

Hammerstein, P. (1996). The evolution of cooperation within and between generations. In P. B. Baltes & U. M. Staudinger (Eds.), *Interactive minds: Life span perspectives on the social foundation of cognition* (pp. 35–58). New York: Cambridge University Press.

Harlow, R. E., & Cantor, N. (1996). Still participating after all these years: A study of life task participation in later life. *Journal of Personality and Social Psychology, 71,* 1235–1249.

Harmon-Jones, E., & Allen, J. J. B. (1998). Anger and frontal brain activity: EEG asymmetry consistent with approach motivation despite negative affective valence. *Journal of Personality and Social Psychology, 74,* 1310–1316.

Harris, D. B. (Ed.). (1957). *The concept of development.* Minneapolis: University of Minnesota Press.

Harter, S. (1998). The development of self-representations. In W. Damon (Editor-in-Chief) & N. Eisenberg (Vol. Ed.), *Handbook of child psychology: Vol. 3. Social, emotional, and personality development* (5th ed., pp. 553–617). New York: Wiley.

Hasher, L., & Zacks, R. T. (1988). Working memory, comprehension, and aging: A review and a new view. *Psychology of Learning and Motivation, 22,* 193–225.

Havighurst, R. J. (1948). *Developmental tasks and education.* New York: Davis McKay.

Havighurst, R. J. (1973). History of developmental psychology: Socialization and personality development through the life span. In P. B. Baltes & K. W. Schaie (Eds.), *Life span developmental psychology* (pp. 3–24). New York: Academic Press.

Hebb, D. O. (1949). *The organization of behavior.* New York: Wiley.

Heckhausen, J. (1997). Developmental regulation across adulthood: Primary and secondary control of age-related challenges. *Developmental Psychology, 33,* 176–187.

Heckhausen, J. (Ed.). (2000). *Motivational psychology of human development: Developing motivation and motivating development.* Oxford, England: Elsevier.

Heckhausen, J., Dixon, R. A., & Baltes, P. B. (1989). Gains and losses in development throughout adulthood as perceived by different adult age groups. *Developmental Psychology, 25,* 109–121.

Heckhausen, J., & Krueger, J. (1993). Developmental expectations for the self and most other people: Age-grading in three functions of social comparison. *Developmental Psychology, 29,* 539–548.

Heckhausen, J., & Schulz, R. (1993). Optimization by selection and compensation: Balancing primary and secondary control in life span development. *International Journal of Behavioral Development, 16,* 287–303.

Heckhausen, J., & Schulz, R. (1995). A life span theory of control. *Psychological Review, 102,* 284–304.

Heidrich, S. M., & Ryff, C. D. (1993). The role of social comparison processes in the psychological adaptation of the elderly. *Journals of Gerontology: Psychological Sciences, 48,* 127–136.

Helmchen, H., Baltes, M. M., Geiselmann, B., Kanowski, S., Linden, M., Reischies, F. M., et al. (1999). Psychiatric illnesses in old age. In P. B. Baltes & K. U. Mayer (Eds.), *Berlin Aging Study: Aging from 70 to 100* (pp. 167–196). New York: Cambridge University Press.

Helson, R., & Kwan, V. S. Y. (2000). Personality development in adulthood: The broad picture and processes in one longitudinal sample. In S. Hampson (Ed.), *Advances in personality psychology* (Vol. 1, pp. 77–106). London: Routledge.

Helson, R., & Wink, P. (1987). Two conceptions of maturity examined in the findings of a longitudinal study. *Journal of Personality and Social Psychology, 53,* 531–541.

Hermans, H. J. M. (1996). Voicing the self: From information processing to dialogical interchange. *Psychological Bulletin, 119*(1), 31–50.

Hertzog, C. (1985). An individual differences perspective: Implications for cognitive research in gerontology. *Research on Aging, 7,* 7–45.

Hertzog, C., Cooper, B. P., & Fisk, A. D. (1996). Aging and individual differences in the development of skilled memory search performance. *Psychology and Aging, 11,* 497–520.

Hertzog, C., & Nesselroade, J. R. (2003). Assessing psychological change in adulthood: An overview of methodological issues. *Psychology and Aging, 18,* 639–657.

Hertzog, C., & Schaie, K. W. (1986). Stability and change in adult intelligence: Pt. 1. Analysis of longitudinal covariance structures. *Psychology and Aging, 1,* 159–171.

Hertzog, C., & Schaie, K. W. (1988). Stability and change in adult intelligence: Pt. 2. Simultaneous analysis of longitudinal means and covariance structures. *Psychology and Aging, 3,* 122–130.

Herzog, A. R., Franks, M. M., Markus, H. R., & Holmberg, D. (1998). Activities and well-being in older age: Effects of self-concept and educational attainment. *Psychology and Aging, 13,* 179–185.

Herzog, A. R., & Markus, H. R. (1999). The self-concept in life span and aging research. In V. L. Bengtson & K. W. Schaie (Eds.), *Handbook of theories of aging* (pp. 227–252). New York: Springer.

Hess, T. M., & Pullen, S. M. (1996). Memory in context. In F. Blanchard-Fields & T. M. Hess (Eds.), *Perspectives on cognitive change in adulthood and aging* (pp. 387–427). New York: McGraw-Hill.

Hetherington, E. M., Lerner, R. M., & Perlmutter, M. (Eds.). (1988). *Child development in life span perspective*. Hillsdale, NJ: Erlbaum.

Hobfoll, S. E. (2001). The influence of culture, community, and the nested-self in the stress process: Advancing conservation of resources theory. *Applied Psychology: An International Review, 50,* 337–421.

Holahan, C. K. (1988). Relation of life goals at age 70 to activity participation and health and psychological well-being among Terman's gifted men and women. *Psychology and Aging, 3,* 286–291.

Holahan, C. K., Sears, R. R., & Cronbach, L. J. (1995). *The gifted group in later maturity.* Stanford, CA: Stanford University Press.

Hollingworth, H. L. (1927). *Mental growth and decline: A survey of developmental psychology.* New York: Appleton.

Hommel, B., Li, K. Z. H., & Li, S.-C. (2004). Visual search across the life span. *Developmental Psychology, 40,* 545–558.

Hooker, K. (2002). New directions for research in personality and aging: A comprehensive model for linking level, structure, and processes. *Journal of Research in Personality, 36,* 318–334.

Horn, J. L. (1970). Organization of data on life span development of human abilities. In L. R. Goulet & P. B. Baltes (Eds.), *Life span developmental psychology: Research and theory* (pp. 423–466). New York: Academic Press.

Horn, J. L. (1982). The theory of fluid and crystallized intelligence in relation to concepts of cognitive psychology and aging in adulthood. In F. I. M. Craik & S. Trehub (Eds.), *Aging and cognitive processes* (pp. 237–278). New York: Plenum Press.

Horn, J. L. (1989). Model of intelligence. In R. L. Linn (Ed.), *Intelligence: Measurement, theory, and public policy* (pp. 29–73). Urbana: University of Illinois Press.

Horn, J. L., & Hofer, S. M. (1992). Major abilities and development in the adult period. In R. J. Sternberg & C. A. Berg (Eds.), *Intellectual development* (pp. 44–99). New York: Cambridge University Press.

Houdé, O. (1995). *Rationalité, développement, et inhibition.* Paris: Presses Universitaires de France.

Hoyer, W. J. (1987). Acquisition of knowledge and the decentralization of g in adult intellectual development. In C. Schooler & K. W. Schaie (Eds.), *Cognitive functioning and social structure over the life course* (pp. 120–141). Norwood, NJ: Ablex.

Hultsch, D. F., & MacDonald, S. W. S. (2004). Intraindividual variability in performance as a theoretical window onto cognitive aging. In R. A. Dixon, L. Bäckman, & L.-G. Nilsson (Eds.), *New frontiers in cognitive aging* (pp. 65–88). New York: Oxford University Press.

Humphreys, L. G., & Davey, T. C. (1988). Continuity in intellectual growth from 12 months to 9 years. *Intelligence, 12,* 183–197.

Huttenlocher, P. R., & Dabholkar, A. S. (1997). Regional differences in synaptogenesis in human cerebral cortex. *Journal of Comparative Neurology, 387,* 167–178.

Johnson, M. H., Posner, M. I., & Rothbart, M. K. (1991). Components of visual orienting in early infancy: Contingency learning, anticipatory looking, and disengaging. *Journal of Cognitive Neuroscience, 3,* 335–344.

Jones, H. E., & Conrad, H. (1933). The growth and decline of intelligence: A study of a homogeneous group between the ages of 10 and 60. *Genetic Psychological Monographs, 13,* 223–298.

Just, M. A., Carpenter, P. A., & Keller, T. A. (1996). The capacity theory of comprehension: New frontiers of evidence and arguments. *Psychological Review, 103*(4), 773–780.

Kagan, J. (1964). American longitudinal research on psychological development. *Child Development, 35,* 1–32.

Kagan, J. (1980). Perspectives on continuity. In O. G. Brim Jr. & J. Kagan (Eds.), *Constancy and change in human development* (pp. 26–74). Cambridge, MA: Harvard University Press.

Kagan, J. (1984). *The nature of the child.* New York: Basic Books.

Kagan, J. (1998). *Three seductive ideas.* Cambridge, MA: Harvard University Press.

Kagan, J., & Moss, H. (1962). *Birth to maturity.* New York: Wiley.

Kagan, J., & Snidman, N. (1991). Temperamental factors in human development. *American Psychologist, 46,* 856–862.

Kahn, R. L., & Antonucci, T. C. (1980). Convoys over the life course: Attachment, roles, and social support. In P. B. Baltes & O. G. Brim Jr. (Eds.), *Life span development and behavior* (Vol. 3, pp. 253–286). New York: Academic Press.

Kail, R. (1996). Nature and consequences of developmental change in speed of processing. *Swiss Journal of Psychology, 55,* 133–138.

Kavsek, M. (2004). Predicting later IQ from infant visual habituation and dishabituation: A meta-analysis. *Journal of Applied Developmental Psychology, 25,* 369–393.

Kempermann, G. (2006). Adult neurogenesis. In P. B. Baltes, P. Reuter-Lorenz, & F. Rösler (Eds.), *Lifespan development and the brain: The perspective of biocultural co-constructivism* (pp. 82–107). Cambridge, England: Cambridge University Press.

Kirkwood, T. B. L. (2003). Age differences in evolutionary selection benefits. In U. M. Staudinger & U. Lindenberger (Eds.), *Understanding human development: Dialogues with life span psychology* (pp. 45–57). Boston: Kluwer Academic.

Kliegl, R., & Baltes, P. B. (1987). Theory-guided analysis of mechanisms of development and aging mechanisms through testing-the-limits and research on expertise. In C. Schooler & K. W. Schaie (Eds.), *Cognitive functioning and social structure over the life course* (pp. 95–119). Norwood, NJ: Ablex.

Kliegl, R., Krampe, R., & Mayr, U. (2003). Formal models of age differences in task-complexity effects. In U. M. Staudinger & U. Lindenberger (Eds.), *Understanding human development: Dialogues with life span psychology* (pp. 289–313). Boston: Kluwer Academic.

Kliegl, R., Mayr, U., & Krampe, R. T. (1994). Time-accuracy functions for determining process and person differences: An application to cognitive aging. *Cognitive Psychology, 26,* 134–164.

Kliegl, R., Smith, J., & Baltes, P. B. (1990). On the locus and process of magnification of age differences during mnemonic training. *Developmental Psychology, 26,* 894–904.

Kline, J. P., Blackhart, G. C., Woodward, K. M., Williams, S. R., & Schwartz, G. E. R. (2000). Anterior electroencephalographic asymmetry changes in elderly women in response to a pleasant and an unpleasant odor. *Biological Psychology, 52,* 241–250.

Klix, F. (1993). *Erwachendes Denken: Geistige Leistungen aus evolutionspsychologischer Sicht.* Heidelberg, Germany: Spektrum Akademischer Verlag.

Kogan, N. (1990). Personality and aging. In J. E. Birren & K. W. Schaie (Eds.), *Handbook of the psychology of aging* (pp. 330–346). New York: Academic Press.

Kohli, M., & Meyer, J. W. (1986). Social structure and social construction of life stages. *Human Development, 29,* 145–180.

Kohn, M. L., & Schooler, C. (1983). *Work and personality.* Norwood, NJ: Ablex.

Kramer, A. F., Hahn, S., Cohen, N. J., Banich, M. T., McAuley, E., Harrison, C. R., et al. (1999). Ageing, fitness and neurocognitive function. *Nature, 400,* 418–419.

Kramer, A. F., Hahn, H., & Gopher, D. (2000). Task coordination and aging: Explorations of executive control processes in the task switching paradigm. *Acta Psychologica, 101,* 339–378.

Kramer, A. F., Louis, B., Coats, E. J., Colcombe, S., Dong, W., & Greenough, W. T. (in press). Environmental influences on cognitive and brain plasticity during aging. *Journal of Gerontology.*

Kramer, A. F., & Willis, S. L. (2002). Enhancing the cognitive vitality of older adults. *Current Directions in Psychological Science, 11,* 173–177.

Krampe, R. T., & Baltes, P. B. (2003). Intelligence as adaptive resource development and resource allocation: A new look through the lenses of SOC and expertise. In R. J. Sternberg & E. L. Grigorenko (Eds.), *Perspectives on the psychology of abilities, competencies, and expertise* (pp. 31–69). New York: Cambridge University Press.

Kray, J., & Lindenberger, U. (2000). Adult age differences in task switching. *Psychology and Aging, 15,* 126–147.

Kruglanski, A. W. (1996). Goals as knowledge structures. In P. M. Gollwitzer & J. A. Bargh (Eds.), *The psychology of action: Linking cognition and motivation to behavior* (pp. 599–618). New York: Guilford Press.

Kruse, A. (1992). Alter im Lebenslauf. In P. B. Baltes & J. Mittelstraß (Eds.), *Zukunft des Alterns und gesellschaftliche Entwicklung* (pp. 331–355). Berlin, Germany: W. de Gruyter.

Kuhlen, R. G. (1963). Age and intelligence: The significance of cultural change in longitudinal versus cross-sectional findings. *Vita Humana, 6,* 113–124.

Kuhn, D. (1995). Microgenetic study of change: What has it told us? *Psychological Science, 6,* 133–139.

Kunzmann, U. (2004). The emotional-motivational side to wisdom. In P. A. Linley & S. Joseph (Eds.), *Positive psychology in practice.* Hoboken, NJ: Wiley.

Kunzmann, U., & Baltes, P. B. (2003a). Beyond the traditional scope of intelligence: Wisdom in action. In R. J. Sternberg, J. Lautrey, & T. I. Lubart (Eds.), *Models of intelligence: International perspectives* (pp. 329–343). Washington, DC: American Psychological Association.

Kunzmann, U., & Baltes, P. B. (2003b). Wisdom-related knowledge: Affective, motivational, and interpersonal correlates. *Personality and Social Psychology Bulletin, 29,* 1104–1119.

Kunzmann, U., & Grühn, D. (2005). Age differences in emotional reactivity: The sample case of sadness. *Psychology and Aging, 20,* 47–59.

Kunzmann, U., Kupperbusch, C. S., & Levenson, R. W. (2005). Emotion regulation in adulthood: A comparison of two age groups. *Psychology and Aging, 20,* 144–159.

Kunzmann, U., Little, T., & Smith, J. (2000). Is age-related stability of subjective well-being a paradox? Cross-sectional and longitudinal evidence from the Berlin Aging Study. *Psychology and Aging, 15*(511–526).

Kunzmann, U., Little, T., & Smith, J. (2002). Perceiving control: A double-edged sword in old age. *Journal of Gerontology, 57B,* 484–491.

Labouvie, G. V., Frohring, W., Baltes, P. B., & Goulet, L. R. (1973). Changing relationship between recall performance and abilities as a function of stage of learning and timing of recall. *Journal of Educational Psychology, 64,* 191–198.

Labouvie-Vief, G. (1977). Adult cognitive development. In search of alternative interpretations. *Merrill Palmer Quarterly, 23,* 277–263.

Labouvie-Vief, G. (1980). Beyond formal operations: Uses and limits of pure logic in life span development. *Human Development, 23,* 141–161.

Labouvie-Vief, G. (1982). Dynamic development and mature autonomy: A theoretical prologue. *Human Development, 25,* 161–191.

Labouvie-Vief, G., Hakim-Larson, J., & Hobart, C. J. (1987). Age, ego level, and the life span development of coping and defense processes. *Psychology and Aging, 2,* 286–293.

Labouvie-Vief, G., Lumley, M. A., Jain, E., & Heinze, H. (2003). Age and gender differences in cardiac reactivity and subjective emotion responses to emotional autobiographical memories. *Emotion, 3,* 115–126.

Lachman, M. E. (1986a). Locus of control in aging research: A case for mulitdimensional and domain-specific assessment. *Psychology and Aging, 1,* 34–40.

Lachman, M. E. (1986b). Personal control in later life: Stability, change, and cognitive correlates. In M. M. Baltes & P. B. Baltes (Eds.), *The psychology of control and aging* (pp. 207–236). Hillsdale, NJ: Erlbaum.

Lachman, M. E. (1991). Perceived control over memory aging: Developmental and intervention perspectives. *Journal of Social Issues, 47,* 159–175.

Lachman, M. E. (2001). *Handbook of midlife development.* New York: Wiley.

Lachman, M. E., & Weaver, L. (1998). Sociodemographic variations in the sense of control by domain: Findings from the MacArthur Studies of Midlife. *Psychology and Aging, 13,* 553–562.

Lang, F. R., Rieckmann, N., & Baltes, M. M. (2002). Adapting to aging losses: Do resources facilitate strategies of selection, compensation, and optimization in everyday functioning? *Journals of Gerontology: Psychological Sciences, 57B,* P501–P509.

Lautrey, J. (2003). A pluralistic approach to cognitive differentiation and development. In R. J. Sternberg & J. Lautrey (Eds.), *Models of intelligence: International perspectives* (pp. 117–131). Washington, DC: American Psychological Association.

Lazarus, R. S. (1996). The role of coping in the emotions and how coping changes over the life course. In C. Magai & S. H. McFadden (Eds.), *Handbook of emotion, adult development, and aging* (pp. 284–306). San Diego, CA: Academic Press.

Lazarus, R. S., & Golden, G. Y. (1981). The function of denial in stress, coping, and aging. In J. L. Lecci, L., Okun, M. A., & Karoly, P. (1994). Life regrets and current goals as predictors of psychological adjustment. *Journal of Personality and Social Psychology, 66*(4), 731–741.

Lehman, H. C. (1953). *Age and achievement.* Princeton, NJ: Princeton University Press.

Lerner, J. V., & Lerner, R. M. (1983). Temperament and adaptation across life: Theoretical and empirical issues. In P. B. Baltes &

O. G. Brim Jr. (Eds.), *Life span development and behavior* (Vol. 5, pp. 198–231). New York: Academic Press.

Lerner, R. M. (Ed.). (1983). *Developmental psychology: Historical and philosophical perspectives.* Hillsdale, NJ: Erlbaum.

Lerner, R. M. (1984). *On the nature of human plasticity.* New York: Cambridge University Press.

Lerner, R. M. (1991). Changing organism-context relations as the basic process of development: A developmental contextual perspective. *Developmental Psychology, 27,* 27–32.

Lerner, R. M. (1995). The limits of biological influence: Behavioral genetics as the emperor's new clothes. *Psychological Inquiry, 6,* 145–156.

Lerner, R. M. (2002). *Concepts and theories of human development* (3rd ed.). Mahwah, NJ: Erlbaum.

Lerner, R. M., & Busch-Rossnagel, N. (Eds.). (1981). *Individuals as producers of their development: A life span perspective.* New York: Academic Press.

Levelt, W. J. M. (1989). *Speaking: From intention to articulation.* Cambridge, MA: MIT Press.

Levenson, R. W. (2000). Expressive, physiological, and subjective changes in emotion across adulthood. In S. H. Qualls & N. Abeles (Eds.), *Dialogues about aging: Psychology responds to the aging revolution* (pp. 123–140). Washington, DC: American Psychological Association.

Levenson, R. W., Carstensen, L. L., Friesen, W. V., & Ekman, P. (1991). Emotion, physiology, and expression in old age. *Psychology and Aging, 6,* 28–35.

Levinson, B., & Reese, H. W. (1967). Patterns of discrimination learning set in preschool children, fifth-graders, college freshmen, and the aged. *Monographs of the Society for Research in Child Development, 32.*

Levinson, D. J. (1986). A conception of adult development. *American Psychologist, 41,* 3–13.

Li, K. Z. H., Lindenberger, U., Freund, A. M., & Baltes, P. B. (2001). Walking while memorizing: Age-related differences in compensatory behavior. *Psychological Science, 12,* 230–237.

Li, S.-C. (2002). Connecting the many levels and facets of cognitive aging. *Current Directions in Psychological Science, 11,* 38–43.

Li, S.-C. (2003). Biocultural orchestration of developmental plasticity across levels: The interplay of biology and culture in shaping the mind and behavior across the life span. *Psychological Bulletin, 129*(2), 171–194.

Li, S.-C. (in press). Neurocomputational perspectives linking neuromodulation, processing noise, representational distinctiveness, and cognitive aging. In R. Cabeza, L. Nyberg, & D. Park (Eds.), *Cognitive neuroscience of aging: Linking cognitive and cerebral aging.* New York: Oxford University Press.

Li, S.-C., Aggen, S. H., Nesselroade, J. R., & Baltes, P. B. (2001). Short-term fluctuations in elderly people's sensorimotor functioning predict text and spatial memory performance: The MacArthur Successful Aging Studies. *Gerontology, 47*(2), 100–116.

Li, S.-C., & Freund, A. M. (2005). Advances in life span psychology: A focus on biocultural and personal influences. *Research in Human Development, 2*(1&2), 1–23.

Li, S.-C., Huxhold, O., & Schmiedek, F. (2004). Aging and attenuated processing robustness: Evidence from cognitive and sensorimotor functioning. *Gerontology, 50,* 28–34.

Li, S.-C., & Lindenberger, U. (1999). Cross-level unification: A computational exploration of the link between deterioration of neurotransmitter systems and dedifferentiation of cognitive abilities in old age. In L.-G. Nilsson & H. J. Markowitsch (Eds.), *Cognitive neuroscience of memory* (pp. 103–146). Seattle, WA: Hogrefe & Huber.

Li, S.-C., & Lindenberger, U. (2002). Coconstructed functionality instead of functional normality: Commentary. *Behavioral and Brain Sciences, 25*(6), 761–762.

Li, S.-C., Lindenberger, U., Hommel, B., Aschersleben, G., Prinz, W., & Baltes, P. B. (2004). Transformations in the couplings among intellectual abilities and constituent cognitive processes across the life span. *Psychological Science, 15,* 155–163.

Li, S.-C., Lindenberger, U., & Sikström, S. (2001). Aging cognition: From neuromodulation to representation. *Trends in Cognitive Science, 5*(11), 479–486.

Lienert, G. A., & Crott, H. W. (1964). Studies on the factor structure of intelligence in children, adolescents, and adults. *Vita Humana, 7,* 147–163.

Lindenberger, U. (2001). Life span theories of cognitive development. In N. J. Smelser & P. B. Baltes (Eds.), *International encyclopedia of the social and behavioral sciences* (pp. 8848–8854). Oxford, England: Elsevier Science.

Lindenberger, U., & Baltes, P. B. (1994). Sensory functioning and intelligence in old age: A strong connection. *Psychology and Aging, 9,* 339–355.

Lindenberger, U., & Baltes, P. B. (1995a). Kognitive Leistungsfähigkeit im hohen Alter: Erste Ergebnisse aus der Berliner Altersstudie. *Zeitschrift für Psychologie, 203,* 283–317.

Lindenberger, U., & Baltes, P. B. (1995b). Testing-the-limits and experimental simulation: Two methods to explicate the role of learning in development. *Human Development, 38,* 349–360.

Lindenberger, U., & Baltes, P. B. (1999). Die Entwicklungspsychologie der lebensspanne: Johann Nicolaus Tetens zu Ehren (1736–1807) [Life span psychology: In honor of Johann Nicolaus Tetens (1736–1807)]. *Zeitschrift für Psychologie, 207,* 299–323.

Lindenberger, U., Kliegl, R., & Baltes, P. B. (1992). Professional expertise does not eliminate negative age differences in imagery-based memory performance during adulthood. *Psychology and Aging, 7,* 585–593.

Lindenberger, U., Li, S.-C., & Bäckman, L. (Eds.). (in press). Methodological and conceptual advances in the study of brain-behavior dynamics: A multivariate life span perspective [Special issue]. *Neuroscience and Biobehavioral Reviews.*

Lindenberger, U., Marsiske, M., & Baltes, P. B. (2000). Memorizing while walking: Increase in dual-task costs from young adulthood to old age. *Psychology and Aging, 15,* 417–436.

Lindenberger, U., & Pötter, U. (1998). The complex nature of unique and shared effects in hierarchical linear regression: Implications for developmental psychology. *Psychological Methods, 3,* 218–230.

Lindenberger, U., Scherer, H., & Baltes, P. B. (2001). The strong connection between sensory and cognitive performance in old age: Not due to sensory acuity reductions operating during cognitive assessment. *Psychology and Aging, 2,* 196–205.

Lindenberger, U., Singer, T., & Baltes, P. B. (2002). Longitudinal selectivity in aging populations: Separating mortality-associated versus experimental components in the Berlin Aging Study (BASE). *Journal of Gerontology: Psychological Sciences, 57B*(6), 474–482.

Lindenberger, U., & Oertzen, T. von (in press). Variability in cognitive aging: From taxonomy to theory. In F. I. M. Craik & E. Bialystok (Eds.), *Life span cognition: Mechanisms of change.* Oxford, England: Oxford University Press.

Linville, P. W. (1987). Self-complexity as a cognitive buffer against stress-related depression and illness. *Journal of Personality and Social Psychology, 52,* 663–676.

Loevinger, J. (1976). *Ego development: Conception and theory.* San Francisco: Jossey-Bass.

Lourenço, O., & Machado, A. (1996). In defense of Piaget's theory: A reply to 10 common criticisms. *Psychological Review, 103,* 143–164.

Lövdén, M., Ghisletta, P., & Lindenberger, U. (2004). Cognition in the Berlin Aging Study (BASE): The first 10 years. *Aging, Neuropsychology, and Cognition, 11,* 104–133.

Lövdén, M., Ghisletta, P., & Lindenberger, U. (2005). Social participation attenuates decline in perceptual speed in old and very old age. *Psychology and Aging 20,* 423–434.

Lövdén, M., & Lindenberger, U. (2005). Development of intellectual abilities in old age: From age gradients to individuals. In O. Wilhelm & R. W. Engle (Eds.), *Handbook of understanding and measuring intelligence* (pp. 203–221). Thousand Oaks, CA: Sage.

Maciel, A. G., Heckhausen, J., & Baltes, P. B. (1994). A life span perspective on the interface between personality and intelligence. In R. J. Sternberg & P. Ruzgis (Eds.), *Intelligence and personality* (pp. 61–103). New York: Cambridge University Press.

Maercker, A. (1995). *Existentielle konfrontation: Eine untersuchung im rahmen eines psychologischen weisheitsparadigmas [Existential confrontation: A study in the framework of a psychological wisdom paradigm]* (Studien und Berichte Nr. 62). Berlin, Germany: Max Planck Institute for Human Development.

Magnus, K., Diener, E., Fujita, F., & Pavot, W. (1993). Extraversion and neuroticism as predictors for objective life events: A longitudinal analysis. *Journal of Personality and Social Psychology, 65,* 1046–1053.

Magnusson, D. (1990). Personality development from an interactional perspective. In L. A. Pervin (Ed.), *Handbook of personality: Theory and research* (pp. 193–222). New York: Guilford Press.

Magnusson, D. (Ed.). (1996). *The life span development of individuals: Behavioural, neurobiological and psychosocial perspectives.* Cambridge, England: Cambridge University Press.

Magnusson, D. (2001). The holistic-interactionistic paradigm: Some directions for empirical developmental research. *European Psychologist, 6,* 153–162.

Magnusson, D., Bergman, L. R., Rudinger, G., & Törestad, B. (Eds.). (1991). *Problems and methods in longitudinal research: Stability and change.* Cambridge, England: Cambridge University Press.

Magnusson, D., & Mahoney, J. (2003). A holistic person approach for research on positive development. In L. G. Aspinwall & U. M. Staudinger (Eds.), *A psychology of human strengths: Fundamental questions and future directions for a positive psychology* (pp. 227–243). Washington, DC: American Psychological Association.

Mandl, H., Gruber, H., & Renkl, A. (1996). Communities of practice toward expertise: Social foundation of university instruction. In P. B. Baltes & U. M. Staudinger (Eds.), *Interactive minds: Life span perspectives on the social foundation of cognition* (pp. 394–411). New York: Cambridge University Press.

Manners, J., & Durkin, K. (2000). Processes involved in adult ego development: A conceptual framework. *Developmental Review, 20,* 475–513.

Markus, H. R., & Wurf, E. (1987). The dynamic self-concept: A social psychological perspective. *Annual Review of Psychology, 38,* 299–337.

Marsh, H. W., Ellis, L. A., & Craven, R. G. (2002). How do preschool children feel about themselves? Unraveling measurement and multidimensional self-concept structure. *Developmental Psychology, 38,* 376–393.

Marsiske, M., Lang, F. R., Baltes, M. M., & Baltes, P. B. (1995). Selective optimization with compensation: Life span perspectives on successful human development. In R. A. Dixon & L. Bäckman (Eds.), *Compensation for psychological defects and declines: Managing losses and promoting gains* (pp. 35–79). Hillsdale, NJ: Erlbaum.

Martin, G. M., Austad, S. N., & Johnson, T. E. (1996). Genetic analysis of ageing: Role of oxidative damage and environmental stresses. *Nature Genetics, 13,* 25–34.

Masten, A. S. (2001). Ordinary magic: Resilience processes in development. *American Psychologist, 56,* 227–238.

Maturana, H., & Varela, F. (1980). *Autopoiesis and cognition: The realization of the living.* Boston: D. Riedel.

Max Planck Institute for Human Development. (2005). *Research Report 2003–2004.* Berlin, Germany: Author.

Mayer, K. U. (1990). Lebensverläufe und sozialer Wandel: Anmerkungen zu einem forschungsprogramm. *Kölner Zeitschrift für Soziologie und Sozialpsychologie, 42*(Sonderheft 31), 7–21.

Mayer, K. U. (2003). The sociology of the life course and life span psychology: Diverging or converging pathways. In U. M. Staudinger & U. Lindenberger (Eds.), *Understanding human development: Dialogues with life span psychology* (pp. 463–481). Boston: Kluwer Academic.

Mayr, U. (2001). Age differences in the selection of mental sets: The role of inhibition, stimulus ambiguity, and response-set overlap. *Psychology and Aging, 16,* 96–109.

Mayr, U., Kliegl, R., & Krampe, R. T. (1996). Sequential and coordinative processing dynamics in figural transformations across the life span. *Cognition, 59,* 61–90.

McAdams, D. P. (1996). Personality, modernity, and the storied self: A contemporary framework for studying persons. *Psychological Inquiry, 7,* 295–321.

McArdle, J. J., & Bell, R. Q. (1999). An introduction to latent growth models for developmental data analysis. In T. D. Little, K. U. Schnabel, & J. Baumert (Eds.), *Modeling longitudinal and multilevel data: Practical issues, applied approaches, and specific examples* (pp. 69–107). Mahwah, NJ: Erlbaum.

McArdle, J. J., & Epstein, D. (1987). Latent growth curves within developmental structural equation models. *Child Development, 58,* 110–133.

McArdle, J. J., Ferrer-Caja, E., Hamagami, F., & Woodcock, R. W. (2002). Comparative longitudinal structural analyses of the growth and decline of multiple intellectual abilities over the life span. *Developmental Psychology, 38,* 115–142.

McArdle, J. J., Hamagami, F., Ellias, M. F., & Robbins, M. A. (1991). Structural modeling of mixed longitudinal and cross-sectional data. *Experimental Aging Research, 17,* 29–51.

McCall, R. M. (1979). The development of intellectual functioning in infancy and the prediction of later, I. Q. In J. D. Osofsky (Ed.), *Handbook of infant development* (pp. 707–740). New York: Wiley.

McCall, R. M. (1994). What process mediates predictions of childhood IQ from infant habituation and recognition memory? Speculations on the roles of inhibition and rate of information processing. *Intelligence, 18,* 107–125.

McCall, R. M., & Carriger, M. S. (1993). A meta-analysis of infant habituation and recognition memory performance as predictors of later IQ. *Child Development, 64,* 57–79.

McClearn, G. E., Johansson, B., Berg, S., Pedersen, N. L., Ahern, F., Petrill, S. A., et al. (1997). Substantial genetic influence on cognitive abilities in twins 80 or more years old. *Science, 276,* 1560–1563.

McClelland, J. L. (1996). Integration of information: Reflections on the theme of Attention and Performance XVI. In I. Toshui & J. L. McClelland (Eds.), *Attention and Performance XVI* (pp. 633–656). Cambridge, MA: MIT Press.

McCrae, R. R. (1989). Age differences and changes in the use of coping mechanisms. *Journal of Gerontology: Psychological Sciences, 44,* 919–928.

McCrae, R. R., Costa, P. T., Ostendorf, F., Angleitner, A., Hrebickova, M., Avia, M. D., et al. (2000). Nature over nurture: Temperament, personality, and life span development. *Journal of Personality and Social Psychology, 78,* 173–186.

McGue, M., Bacon, S., & Lykken, D. T. (1993). Personality stability and change in early adulthood: A behavioral genetic analysis. *Developmental Psychology, 29,* 96–109.

McGue, M., Bouchard, T. J., Jr., Iacono, W. G., & Lykken, D. T. (1993). Behavioral genetics of cognitive ability: A life span perspective. In R. Plomin & G. E. McClearn (Eds.), *Nature, nurture, and psychology* (pp. 59–76). Washington, DC: American Psychological Association.

Medawar, P. B. (1946). Old age and natural death. *Modern Quarterly, 1,* 30–56.

Metcalfe, J., & Mischel, W. (1999). A hot/cool-system analysis of delay of gratification: Dynamics of willpower. *Psychological Review, 106,* 3–19.

Miller, E. K., & Cohen, J. D. (2001). An integrative theory of prefrontal cortex function. *Annual Review of Neuroscience, 24,* 167–202.

Mischel, W. (1996). Principles of self-regulation: The nature of willpower and self-control. In E. T.

Mischel, W. (2004). Toward an integrative science of the person. *Annual Review of Psychology, 55,* 1–22.

Mischel, W., & Shoda, Y. (1999). Integrating dispositions and processing dynamics within a unified theory of personality: The cognitive-affective personality system. In L. Pervin & O. John (Eds.), *Handbook of personality: Theory and research* (pp. 197–218). New York: Guilford Press.

Mischel, W., Shoda, Y., & Rodriguez, M. L. (1989). Delay of gratification in children. *Science, 244,* 933–938.

Mitrushina, M., & Satz, P. (1991). Stability of cognitive functions in young-old versus old-old individuals. *Brain Dysfunction, 4,* 174–181.

Molander, B., & Bäckman, L. (1993). Performance of a complex motor skill across the life span: General trends and qualifications. In J. Cerella, J. Rybash, W. Hoyer, & M. L. Commons (Eds.), *Adult information processing: Limits on loss* (pp. 231–257). San Diego, CA: Academic Press.

Molenaar, P. C. M. (1986). On the impossibility of acquiring more powerful structures: A neglected alternative. *Human Development, 29,* 245–251.

Molenaar, P. C. M., Boomsma, D. I., & Dolan, C. V. (1991). Genetic and environmental factors in a developmental perspective. In D. Magnusson, L. R. Bergman, G. Rudinger, & B. Törestad (Eds.), *Problems and methods in longitudinal research: Stability and change* (pp. 250–273). Cambridge, England: Cambridge University Press.

Molenaar, P. C. M., Boomsma, D. I., & Dolan, C. V. (1993). Genetic and environmental factors in a developmental perspective. In D. Magnusson, L. R. Bergman, G. Rudinger, & B. Törestad (Eds.), *Problems and methods in longitudinal research: Stability and change* (pp. 250–273). Cambridge, England: Cambridge University Press.

Molenaar, P. C. M., Huizenga, H. M., & Nesselroade, J. R. (2003). The relationship between the structure of interindividual and intraindividual variability: A theoretical and empirical vindication of development systems theory. In U. M. Staudinger & U. Lindenberger (Eds.), *Understanding human development: Dialogues with life span psychology* (pp. 339–360). Boston: Kluwer Academic.

Moss, H. A., & Susman, E. J. (1980). Longitudinal study of personality development. In O. G. Brim Jr. & J. Kagan (Eds.), *Constancy and change in human development* (pp. 530–595). Cambridge, MA: Harvard University Press.

Mroczek, D. K., & Spiro, R. A., III. (2003). Modeling intraindividual change in personality traits: Findings from the Normative Aging Study. *Journals of Gerontology, 58B,* P153–P165.

Müller-Brettel, M., & Dixon, R. A. (1990). Johann Nicolas Tetens: A forgotten father of developmental psychology? *International Journal of Behavioral Development, 13,* 215–230.

Neely, A. S., & Bäckman, L. (1993). Long-term maintenance of gains from memory training in older adults: Two $3^{1}/_{2}$-year follow-up studies. *Journal of Gerontology, 48,* 233–237.

Nelson, C. A. (2006). Neurobehavioral development in the context of biocultural co-constructivism. In P. B. Baltes, P. Reuter-Lorenz, & F. Rösler (Eds.), *Lifespan development and the brain: The perspective of biocultural co-constructivism* (pp. 61–81). Cambridge, England: Cambridge University Press.

Nesselroade, C. S., & Schmidt McCollam, K. M. (2000). Putting the process in development processes. *International Journal of Behavioral Development, 24*(3), 295–300.

Nesselroade, J. R. (1991). Interindividual differences in intraindividual change. In L. M. Collins & J. L. Horn (Eds.), *Best methods for the analysis of change: Recent advances, unanswered questions, future directions* (pp. 92–105). Washington, DC: American Psychological Association.

Nesselroade, J. R. (2002). Elaborating the differential in differential psychology. *Multivariate Behavioral Research, 37,* 543–561.

Nesselroade, J. R. (2002). Elaborating the differential in differential psychology. *Multivariate Behavioral Research, 37,* 543–561.

Nesselroade, J. R., & Baltes, P. B. (1974). Adolescent personality development and historical change: 1970–1972. *Monographs of the Society for Research in Child Development, 39.*

Nesselroade, J. R., & Baltes, P. B. (Eds.). (1979). *Longitudinal research in the study of behavior and development.* New York: Academic Press.

Nesselroade, J. R., & Ghisletta, P. (2003). Structuring and measuring change over the life span. In U. M. Staudinger & U. Lindenberger (Eds.), *Understanding human development: Dialogues with life span psychology* (pp. 317–337). Boston: Kluwer Academic.

Nesselroade, J. R., & Reese, H. W. (Eds.). (1973). *Life span developmental psychology: Methological issues.* New York: Academic Press.

Nesselroade, J. R., & Thompson, W. W. (1995). Selection and related threats to group comparisons: An example comparing factorial structures of higher and lower ability groups of adult twins. *Psychological Bulletin, 117,* 271–284.

Neugarten, B. L. (1969). Continuities and discontinuities of psychological issues into adult life. *Human Development, 12,* 121–130.

Neyer, F. J., & Asendorpf, J. B. (2001). Personality-relationship transaction in young adulthood. *Journal of Personality and Social Psychology, 81,* 1190–1204.

Nurmi, J.-E. (1992). Age differences in adult life goals, concerns, and their temporal extension: A life course approach to future-oriented motivation. *International Journal of Behavioral Development, 15,* 487–508.

Nyberg, L., Sandblom, J., Jones, S., Neely, A. S., Petersson, K. M., Ingvar, M. I., et al. (2003). Neural correlates of training-related memory improvement in adulthood and aging. *Proceedings of the National Academy of Sciences, USA, 100*(23), 13728–13733.

Oberauer, K., & Kliegl, R. (2001). Beyond resources: Formal models for complexity effects and age differences in working memory. *European Journal of Cognitive Psychology, 13,* 187–215.

Oettingen, G. (1996). Positive fantasy and motivation. In P. M. Gollwitzer & J. A. Bargh (Eds.), *The psychology of action: Linking cognition and motivation to action* (pp. 236–259). New York: Guilford Press.

Oettingen, G. (1997). *Die psychologie des zukunftsdenkens* [Psychology of thinking about the future]. Göttingen, Germany: Hogrefe.

Ogilvie, D. M., Rose, K. M., & Heppen, J. B. (2001). A comparison of personal project motives in three age groups. *Basic and Applied Social Psychology, 23,* 207–215.

Osiewacz, H. D. (1995). Molekulare mechanismen biologischen alterns [Molecular models of biological aging]. *Biologie in unserer Zeit, 25,* 336–344.

Overton, W. F., & Reese, H. W. (1973). Models of development: Methodological implications. In J. R. Nesselroade & H. W. Reese (Eds.), *Life span developmental psychology: Methodological issues* (pp. 65–86). New York: Academic Press.

Park, D. C., Polk, T. A., Park, R., Minear, M., Savage, A., & Smith, M. R. (2004). Aging reduces neural specialization in ventral visual cortex. *Proceedings of the National Academy of Sciences, USA, 101,* 13091–13095.

Parke, R. D., Ornstein, P. A., Rieser, J. J., & Zahn-Waxler, C. (1991). Editors' introduction to the APA Centennial Series. *Developmental Psychology, 28,* 3–4.

Pascual-Leone, J. (1970). A mathematical model for the transition rule in Piaget's developmental stages. *Acta Psychologica, 32,* 301–342.

Pascual-Leone, J. (1983). Growing into human maturity: Toward a metasubjective theory of adulthood stages. In P. B. Baltes & O. G. Brim Jr. (Eds.), *Life span development and behavior* (Vol. 5, pp. 117–156). New York: Academic Press.

Pasupathi, M., Staudinger, U. M., & Baltes, P. B. (2001). Seeds of wisdom: Adolescents' knowledge and judgment about difficult life problems. *Developmental Psychology, 37,* 351–361.

Pedersen, N. L. (1991). Behavioral genetic concepts in longitudinal analyses. In D. Magnusson, L. R. Bergman, G. Rudinger, & B. Törestad (Eds.), *Problems and methods in longitudinal research: Stability and change* (Vol. 5, pp. 236–249). Cambridge, England: Cambridge University Press.

Pedersen, N. L., & Reynolds, C. A. (2002). Stability and change in adult personality: Genetic and environmental components. *European Journal of Personality, 16,* 77–78.

Perlmutter, M. (1988). Cognitive potential throughout life. In J. E. Birren & V. L. Bengtson (Eds.), *Emergent theories of aging* (pp. 247–268). New York: Springer.

Pervin, L. (2001). A dynamic systems approach to personality. *European Psychologist, 6*(3), 172–176.

Pervin, L., & John, O. (1999). *Handbook of personality: Theory and research* (2nd ed.). New Brunswick, NJ: Rutgers University Press.

Perz, C. A., DiClemente, C. C., & Carbonari, J. P. (1996). Doing the right thing at the right time? The interaction of stages and processes of change in successful smoking cessation. *Health Psychology 15*(6), 462–468.

Peterson, C., Seligman, M. E. P., Yurko, K. H., Martin, L. R., & Friedman, H. S. (1998). Catastrophizing and untimely death. *Psychological Science, 9,* 127–130.

Petersson, K. M., & Reis, A. (2006). Characteristics of illiterate and literate cognitive processing: Implications of brain–behavior co-constructivism. In P. B. Baltes, P. Reuter-Lorenz, & F. Rösler (Eds.), *Lifespan development and the brain: The perspective of biocultural co-constructivism* (pp. 279–305). New York: Cambridge University Press.

Piaget, J. (1970). Piaget's theory. In P. H. Mussen (Ed.), *Carmichaels manual of child psychology* (pp. 703–732). New York: Wiley.

Piaget, J. (1971). *Biologie et connaissance: Essai sur les relations entre les régulations organiques et les processes cognitifs* [Biology and knowledge: An essay on the relations between organic regulations and cognitive processes]. Chicago: University of Chicago Press. (Original work published in French, 1967)

Piaget, J. (1972). Intellectual evolution from adolescence to adulthood. *Human Development, 15,* 1–12.

Piaget, J. (1980). *Les formes elementaires de la dialectique* [Elementary forms of dialectic]. Paris: Gallimard.

Plessner, H. (1965). *Die Stufen des Organischen und der Mensch: Einleitung in die philosophische Anthropologie.* Berlin, Germany: W. de Gruyter.

Plomin, R. (1994). *Genetics and experience: The interplay between nature and nurture.* Thousand Oaks, CA: Sage.

Plomin, R., & Caspi, A. (1999). Behavioral genetics and personality. In L. A. Pervin & O. P. John (Eds.), *Handbook of personality theory and research* (Vol. 2, pp. 251–276). New York: Guilford Press.

Plomin, R., DeFries, J. C., & Loehlin, J. C. (1977). Genotype-environment interaction and correlation in the analysis of human behavior. *Psychological Bulletin, 84,* 309–322.

Plomin, R., & Thompson, L. (1988). Life span developmental behavioral genetics. In P. B. Baltes, D. L. Featherman, & R. M. Lerner (Eds.), *Life span development and behavior* (Vol. 8, pp. 1–31). Hillsdale, NJ: Erlbaum.

Porges, S. W., & Doussard-Roosevelt, J. A. (1997). The psychophysiology of temperament. In J. D. Noshpitz (Ed.), *The handbook of child and adolescent psychiatry* (pp. 250–268). New York: Wiley.

Porges, S. W., Doussard-Roosevelt, J. A., Portales, A. L., & Suess, P. E. (1994). Cardiac vagal tone: Stability and relation to difficulties in infants and 3-year-olds. *Developmental Psychology, 27,* 289–300.

Pressey, S. L., Janney, J. E., & Kuhlen, R. G. (1939). *Life: A psychological survey.* New York: Harper.

Prigogine, I., & Stengers, I. (1984). *Order out of chaos.* New York: Bantam.

Pulkkinen, L., & Caspi, A. (Eds.). (2002). *Paths to successful development: Personality in the life course.* New York: Cambridge University Press.

Quetelet, A. (1835). *Sur l'homme et de développememt de ses facultés.* Paris: Bachelier.

Quetelet, A. (1842). *A treatise on man and the development of his faculties.* Edinburgh, Scotland: Chambers.

Raz, N. (2000). Aging of the brain and its impact on cognitive performance: Integration of structural and functional findings. In F. I. M. Craik & T. A. Salthouse (Eds.), *The handbook of aging and cognition* (2nd ed., pp. 1–90). Mahwah, NJ: Erlbaum.

Raz, N., Lindenberger, U., Rodrique, K. M., Kennedy, K. M., Head, D., Williamson, A., et al. (2005). Regional brain changes in aging healthy adults: General trends, individual differences, and modifiers. *Cerebral Cortex, 15,* 1676–1689.

Reese, H. W. (1994). The data/theory dialectic: The nature of scientific progress. In S. H. Cohen & H. W. Reese (Eds.), *Life span developmental psychology: Methodological contributions* (pp. 1–27). Hillsdale, NJ: Erlbaum.

Reese, H. W., & Lipsitt, L. P. (1970). *Experimental child psychology.* New York: Academic Press.

Reese, H. W., & Overton, W. F. (1970). Models of development and theories of development. In L. R. Goulet & P. B. Baltes (Eds.), *Life span developmental psychology: Research and theory* (pp. 115–145). New York: Academic Press.

Reinert, G. (1970). Comparative factor analytic studies of intelligence throughout the life span. In L. R. Goulet & P. B. Baltes (Eds.), *Life span developmental psychology: Research and theory* (pp. 476–484). New York: Academic Press.

Reinert, G. (1979). Prolegomena to a history of life span developmental psychology. In P. B. Baltes & O. G. Brim Jr. (Eds.), *Life span development and behavior* (Vol. 2, pp. 205–254). New York: Academic Press.

Reinert, G., Baltes, P. B., & Schmidt, G. (1966). Kritik einer Kritik der Differenzierungshypothese der Intelligenz. *Zeitschrift für Experimentelle und Angewandte Psychologie, 13,* 602–610.

Resnick, L. B., Levine, J. M., & Teasley, S. D. (Eds.). (1991). *Perspectives on socially shared cognition.* Washington, DC: American Psychological Association.

Reuchlin, M. (1978). Processus vicariants et différences individuelles [Vicariant processes and individual differences]. *Journal de Psychologie, 2,* 133–145.

Reuter-Lorenz, P. A. (2002). New visions of the aging mind and brain. *Trends in Cognitive Sciences, 6,* 394–400.

Riediger, M., & Freund, A. M. (in press). Focusing and restricting: Two aspects of motivational selectivity in adulthood. *Psychology and Aging.*

Riediger, M., Freund, A. M., & Baltes, M. M. (2005). Managing life through personal goals: Intergoal facilitation and intensity of goal pursuit in younger and older adulthood. *Journal of Gerontology: Psychological Sciences, 60B,* 84–91.

Riediger, M., Li, S.-C., & Lindenberger, U. (in press). Selection, optimization, and compensation (SOC) as developmental mechanisms of adaptive resource allocation: Review and preview. In J. E. Birren & K. W. Schaie (Eds.), *Handbook of the psychology of aging* (6th ed.). Amsterdam: Elsevier.

Riegel, K. F. (1958). Ergebnisse und probleme der psychologischen alternsforschung [Conclusions and problems of psychological aging research.]. *Vita Humana, 1,* 52–64 and 111–127.

Riegel, K. F. (1973). Developmental psychology and society: Some historical and ethical considerations. In J. R. Nesselroade & H. W. Reese (Eds.), *Life span developmental psychology: Methodological issues* (pp. 1–23). New York: Academic Press.

Riegel, K. F. (1976). The dialectics of human development. *American Psychologist, 31,* 689–700.

Riley, M. W. (1987). On the significance of age in sociology. *American Sociological Review, 52,* 1–14.

Riley, M. W., Johnson, M., & Foner, A. (Eds.). (1972). *Aging and society: A sociology of age stratification* (Vol. 3). New York: Sage.

Roberts, B., & Caspi, A. (2003). The cumulative continuity model of personality development: Striking a balance between continuity and change in personality traits across the life course. In U. M. Staudinger & U. Lindenberger (Eds.), *Understanding human development: Dialogues with life span psychology* (pp. 183–214). Boston: Kluwer Academic.

Roberts, B. W., & DelVecchio, W. F. (2000). The rank-order consistency of personality traits from childhood to old age: A quantitative review of longitudinal studies. *Psychological Bulletin, 126,* 3–25.

Ross, M. (1997). Validating memories. In N. L. Stein, P. A. Ornstein, B. Tversky, & C. Brainerd (Eds.), *Memory for everyday and emotional events* (pp. 49–82). Mahwah, NJ: Erlbaum.

Ross, M., & Bühler, R. (2001). Identity through time: Constructing personal pasts and futures. In A. Tesser & N. Schwarz (Eds.), *Blackwell handbook in social psychology: Intrapersonal processes* (pp. 518–544). Malden, MA: Blackwell.

Rothbart, M. K. (2001). Temperament and human development. In N. J. Smelser & P. B. Baltes (Eds.), *International encyclopedia of the social and behavioral sciences* (pp. 15586–15591). New York: Elsevier.

Rothbart, M. K., & Bates, J. E. (1998). Temperament. In W. Damon (Editor-in-Chief) & N. Eisenberg (Vol. Ed.), *Handbook of child psychology: Vol. 3. Social, emotional, and personality development* (5th ed., pp. 619–700). New York: Wiley.

Rott, C., & Thomae, H. (1991). Coping in longitudinal perspective: Findings from the Bonn Longitudinal Study on Aging. *Journal of Cross-Cultural Gerontology, 6,* 23–40.

Rowe, J. W. (1997). Editorial: The new gerontology. *Science, 278,* 367.

Rowe, J. W., & Kahn, R. L. (1987). Human aging: Usual and successful. *Science, 237,* 143–149.

Rutter, M. (1987). Resilience in the face of adversity: Protective factors and resistance to psychiatric disorder. *British Journal of Psychiatry, 147,* 598–611.

Rutter, M., & Rutter, M. (1993). *Developing minds: Challenge and continuity across the life span.* New York: Basic Books.

Rybash, J. M., Hoyer, W. J., & Roodin, P. A. (1986). *Adult cognition and aging: Developmental changes in processing, knowing, and thinking.* New York: Pergamon Press.

Ryder, N. B. (1965). The cohort as a concept in the study of social change. *American Sociological Review, 30,* 843–861.

Ryder, R. G. (1967). Birth to maturity revisited: A canonical reanalysis. *Journal of Personality and Social Psychology, 7,* 168–172.

Ryff, C. D. (1984). Personality development from the inside: The subjective experience of change in adulthood and aging. In P. B. Baltes & O. G. Brim Jr. (Eds.), *Life span development and behavior* (Vol. 6, pp. 249–279). New York: Academic Press.

Ryff, C. D. (1989a). Beyond Ponce de Leon and life satisfaction: New directions in quest of successful aging. *International Journal of Behavioral Development, 12,* 35–55.

Ryff, C. D. (1989b). Happiness is everything, or is it? Explorations on the meaning of psychological well-being. *Journal of Personality and Social Psychology, 57,* 1069–1081.

Ryff, C. D. (1991). Possible selves in adulthood and old age: A tale of shifting horizons. *Psychology and Aging, 6,* 286–295.

Ryff, C. D., & Keyes, C. L. M. (1995). The structure of psychological well-being revisited. *Journal of Personality and Social Psychology, 69,* 719–727.

Saffran, J. R., Aslin, R. N., & Newport, E. L. (1996). Statistical learning by 8-month-old infants. *Science, 274*(5294), 1926–1928.

Salthouse, T. A. (1984). Effects of age and skill in typing. *Journal of Experimental Psychology: General, 113,* 345–371.

Salthouse, T. A. (1991). *Theoretical perspectives on cognitive aging.* Hillsdale, NJ: Erlbaum.

Salthouse, T. A. (1995). Refining the concept of psychological compensation. In R. A. Dixon & L. Bäckman (Eds.), *Compensating for psychological deficits and declines* (pp. 21–34). Mahwah, NJ: Erlbaum.

Salthouse, T. A. (1996). The processing-speed theory of adult age differences in cognition. *Psychological Review, 103,* 403–437.

Salthouse, T. A. (2003). Interrelations of aging, knowledge, and cognitive performance. In U. M. Staudinger & U. Lindenberger (Eds.), *Understanding human development: Dialogues with life span psychology* (pp. 265–287). Boston: Kluwer Academic.

Salthouse, T. A., Hambrick, D. Z., Lukas, K. E., & Dell, T. C. (1996). Determinants of adult age differences on synthetic work performance. *Journal of Experimental Psychology: Applied, 2,* 305–329.

Salthouse, T. A., & Kail, R. (1983). Memory development throughout the life span: The role of processing rate. In P. B. Baltes (Ed.), *Life span development and behavior* (Vol. 5, pp. 89–116). New York: Academic Press.

Salthouse, T. A., & Meinz, E. J. (1995). Aging, inhibition, working memory, and speed. *Journal of Gerontology: Psychological Sciences, 50B,* 297–306.

Sanford, E. C. (1902). Mental growth and decay. *American Journal of Psychology, 13,* 426–449.

Scarr, S. (1993a). Biological and cultural diversity: The legacy of Darwin for development. *Child Development, 64,* 1333–1353.

Scarr, S. (1993b). Genes, experience, and development. In D. Magnusson & P. Casaer (Eds.), *Longitudinal research on individual development: Present status and future perspectives* (pp. 26–50). Cambridge, England: Cambridge University Press.

Scarr, S., & McCartney, K. (1983). How people make their own environments: A theory of genotype environment effects. *Child Development, 54,* 424–435.

Schadewaldt, W. (1975). *Nachwort zu Elektra* [Epilogue to Electra]. Stuttgart, German: Reclam.

Schaie, K. W. (1965). A general model for the study of developmental problems. *Psychological Bulletin, 64,* 92–107.

Schaie, K. W. (1970). A reinterpretation of age-related changes in cognitive structure and functioning. In L. R. Goulet & P. B. Baltes (Eds.), *Life span developmental psychology: Research and theory* (pp. 485–507). New York: Academic Press.

Schaie, K. W. (1989). The hazards of cognitive aging. *Gerontologist, 29,* 484–493.

Schaie, K. W. (1994). The course of adult intellectual development. *American Psychologist, 49,* 304–313.

Schaie, K. W. (1996). *Intellectual development in adulthood: The Seattle Longitudinal Study.* New York: Cambridge University Press.

Schaie, K. W. (2005). *Developmental influences on intelligence: The Seattle Longitudinal Study.* New York: Oxford University Press.

Schaie, K. W., & Baltes, P. B. (1975). On sequential strategies in developmental research: Description or explanation? *Human Development, 18,* 384–390.

Schaie, K. W., Maitland, S. B., Willis, S. L., & Intieri, R. C. (1998). Longitudinal invariance of adult psychometric ability factor structures across 7 years. *Psychology and Aging, 13,* 8–20.

Schaie, K. W., & Willis, S. L. (1993). Age difference patterns of psychometric intelligence in adulthood: Generalizability within and across ability domains. *Psychology and Aging, 8,* 44–55.

Schaie, K. W., Willis, S. L., Hertzog, C., & Schulenberg, J. E. (1987). Effects of cognitive training on primary mental ability structure. *Psychology and Aging, 2,* 233–242.

Schaie, K. W., Willis, S. L., & Pennak, S. (2005). An historical framework for cohort differences in intelligence. *Research in Human Development, 2*(1&2), 43–67.

Scheier, M. F., & Carver, C. S. (1987). Dispositional optimism and physical well-being: The influence of generalized outcome expectancies on health. *Journal of Personality, 55,* 169–210.

Schindler, I., & Staudinger, U. M. (2005a). Life span perspectives on self and personality: The dynamics between the mechanics and pragmatics. In W. Greve, K. Rothermund, & D. Wentura (Eds.), *The adaptive self: Personal continuity and intentional self-development* (pp. 3–30). Göttingen, Germany: Hogrefe & Huber.

Schindler, I., & Staudinger, U. M. (2005b). *Obligatory and optional personal life investments in old age.* Manuscript submitted for publication.

Schmidt, L. R. (1971). Testing the limits im Leistungsverhalten: Möglichkeiten und Grenzen. In E. Duhm (Ed.), *Praxis der klinischen Psychologie* (Vol. 2, pp. 9–29). Göttingen, Germany: Hogrefe & Huber.

Schneider, W., & Bjorklund, D. F. (2003). Memory and knowledge development. In D. Kuhn & Siegler (Eds.), *Handbook of child psychology: Vol. 2. Cognition, perception, and language* (pp. 467–521). New York: Wiley.

Schneirla, T. C. (1957). The concept of development in comparative psychology. In D. B. Harris (Ed.), *The concept of development* (pp. 78–108). Minneapolis: University of Minnesota Press.

Schooler, C., Mulatu, M. S., & Oates, G. (1999). The continuing effects of substantively complex work on the intellectual functioning of older workers. *Psychology and Aging, 14,* 483–406.

Schulz, R., & Heckhausen, J. (1996). A life span model of successful aging. *American Psychologist, 51,* 702–714.

Schwarz, N., & Bohner, G. (1996). Feelings and their motivational implications: Moods and the action sequence. In P. M. Gollwitzer & J. A. Bargh (Eds.), *The psychology of action* (pp. 119–145). New York: Guilford Press.

Schwarz, N., & Strack, F. (1999). Reports of subjective well-being: Judgmental processes and their methodological implications. In D. Kahneman, E. Diener, & N. Schwarz (Eds.), *Well-being: The foundation of hedonic psychology (pp. 61–84).* New York: Russell Sage Foundation.

Sears, P. S., & Barbee, A. H. (1977). Career and life satisfactions among Terman's gifted women. In J. Stanley, W. George, & C. Solano (Eds.), *The gifted and the creative: A fifty-year perspective* (pp. 28–65). Baltimore: Johns Hopkins University Press.

Settersten, R. A., Jr. (2005). Toward a stronger partnership between life-course sociology and life span psychology. *Research in Human Development, 2*(1).

Sherry, D. F., & Schacter, D. L. (1987). The evolution of multiple memory systems. *Psychological Review, 94,* 439–454.

Shrager, J., & Johnson, M. H. (1996). Dynamic plasticity influences the emergence of function in a simple cortical array. *Neural Networks, 9,* 111–129.

Shweder, R. A. (1991). *Thinking through cultures.* Cambridge, MA: Harvard University Press.

Siegler, R. S. (1989). Mechanisms of cognitive development. *Annual Review of Psychology, 40,* 353–379.

Siegler, R. S., & Crowley, K. (1991). The microgenetic method: A direct means for studying cognitive development. *American Psychologist, 46,* 606–620.

Siegler, R. S., & Crowley, K. (1994). Constraints on learning in nonprivileged domains. *Cognitive Psychology, 27,* 194–226.

Simon, H. A., & Chase, W. G. (1973). Skill in chess. *American Scientist, 61,* 394–403.

Simonton, D. K. (1988). Age and outstanding achievement: What do we know after a century of research? *Psychological Bulletin, 104,* 251–267.

Simonton, D. K. (1989). The swan-song phenomenon: Last-works effects for 172 classical composers. *Psychology and Aging, 4,* 42–47.

Singer, J. L. (1984). The private personality. *Personality and Social Psychology Bulletin, 10,* 7–30.

Singer, T., Lindenberger, U., & Baltes, P. B. (2003). Plasticity of memory for new learning in very old age: A story of major loss? *Psychology and Aging, 18,* 306–317.

Singer, T., Seymour, B., O'Doherty, J., Kaube, H., Dolan, R. J., & Frith, C. D. (2004). Empathy for pain involves the affective but not the sensory components of pain. *Science, 303,* 1157–1162.

Singer, T., Verhaeghen, P., Ghisletta, P., Lindenberger, U., & Baltes, P. B. (2003). The fate of cognition in very old age: Six-year longitudinal findings in the Berlin Aging Study. *Psychology and Aging, 18,* 318–331.

Singer, W. (1995). Development and plasticity of cortical processing architectures. *Science, 270,* 758–764.

Singer, W. (2003). The nature–nurture problem revisited. In U. M. Staudinger & U. Lindenberger (Eds.), *Understanding human development: Dialogues with life span psychology* (pp. 437–447). Boston: Kluwer Academic.

Skinner, B. F. (1966). The phylogeny and ontogeny of behavior. *Science, 153,* 1205–1213.

Skinner, E. A. (1996). A guide to constructs of control. *Journal of Personality and Social Psychology, 71,* 549–570.

Skinner, E. A., & Connell, J. P. (1986). Control understanding: Suggestions form a developmental framework. In M. M. Baltes & P. B. Baltes (Eds.), *The psychology of control and aging* (pp. 35–69). Hillsdale, NJ: Erlbaum.

Small, B. J., Hertzog, C., Hultsch, D. F., & Dixon, R. A. (2003). Stability and change in adult personality over 6 years: Findings from the Victoria Longitudinal Study. *Journals of Gerontology, 58B,* 166–176.

Smith, F., Fagan, J. F., & Ulvund, S. E. (2002). The relation of recognition memory in infancy and parental socioeconomic status to later intellectual performance. *Intelligence, 30,* 247–259.

Smith, J. (1999). Life planning: Anticipating future life goals and managing personal development. In J. Brandtstädter & R. M. Lerner (Eds.), *Action and self-development: Theory and research through the life span* (pp. 223–255). Thousand Oaks, CA: Sage.

Smith, J. (2003). The gain-loss dynamic in life span development: Implications for change in self and personality during old and very old age. In U. M. Staudinger & U. Lindenberger (Eds.), *Understanding human development: Dialogues with life span psychology* (pp. 215-–241).

Smith, J., & Baltes, P. B. (1993). Differential psychological aging: Profiles of the old and very old. *Ageing and Society, 13,* 551–587.

Smith, J., & Baltes, P. B. (1997). Profiles of psychological functioning in the old and oldest old. *Psychology and Aging, 12,* 458–472.

Smith, J., & Baltes, P. B. (1999). Trends and profiles of psychological functioning in very old age. In P. B. Baltes & K. U. Mayer (Eds.), *The Berlin Aging Study: Aging from 70 to 100* (pp. 197–226). New York: Cambridge University Press.

Smith, J., & Freund, A. M. (2002). The dynamics of possible selves in old age. *Journal of Gerontology: Psychological Sciences, 57B,* P492–P500.

Smith, J., Staudinger, U. M., & Baltes, P. B. (1994). Occupational settings facilitative of wisdom-related knowledge: The sample case of clinical psychologists. *Journal of Consulting and Clinical Psychology, 62,* 989–1000.

Smith, L. B., & Thelen, E. (2003). Development as a dynamic system. *Trends in Cognitive Science, 7*(8), 343–348.

Sorensen, A. B., Weinert, F. E., & Sherrod, L. (Eds.). (1986). *Human development and the life course: Multidisciplinary perspectives.* Hillsdale, NJ: Erlbaum.

Sowarka, D., & Baltes, P. B. (1986). Intelligenzentwicklung. In W. Sarges & R. Fricke (Eds.), *Psychologie für die Erwachsenenbildung-Weiterbildung* (pp. 262–272). Göttingen, Germany: Hogrefe & Huber.

Spelke, E., Vishton, P., & von Hofsten, C. (1995). Object perception, object-directed action, and physical knowledge in infancy. In M. S. Gazzaniga (Ed.), *The cognitive neurosciences* (pp. 165–179). Cambridge, MA: MIT Press.

Staudinger, U. M. (1996). Wisdom and the social-interactive foundation of the mind. In P. B. Baltes & U. M. Staudinger (Eds.), *Interactive minds: Life span perspectives on the social foundation of cognition* (pp. 276–315). New York: Cambridge University Press.

Staudinger, U. M. (1999a). Older and wiser? Integrating results on the relationship between age and wisdom-related performance. *International Journal of Behavioral Development, 23*(3), 641–664.

Staudinger, U. M. (1999b). Social cognition and a psychological approach to an art of life. In F. Blanchard-Fields & T. Hess (Eds.), *Social cognition, adult development and aging* (pp. 343–375). New York: Academic Press.

Staudinger, U. M. (2000). Viele Gründe sprechen dagegen und trotzdem fühlen viele Mnschen sich wohl: Das Paradox des subjektiven Eohlbefindens [Many reasons speak against it, nevertheless many people are happy: The paradox of subjective well-being]. *Psychologische Rundschau, 51,* 185–197.

Staudinger, U. M. (2001). Life reflection: A social-cognitive analysis of life review. *Review of General Psychology, 5,* 148–160.

Staudinger, U. M. (2005). Personality and aging. In M. Johnson, V. L. Bengtson, P. G. Coleman, & T. Kirkwood (Eds.), *Cambridge handbook of age and ageing.* Cambridge, England: Cambridge University Press.

Staudinger, U. M. (in press). Personality and aging. In M. Johnson, V. L. Bengtson, P. G. Coleman, & T. Kirkwood (Eds.), *Cambridge handbook of age and ageing.* Cambridge, England: Cambridge University Press.

Staudinger, U. M., & Baltes, P. B. (1996). Interactive minds: A facilitative setting for wisdom-related performance? *Journal of Personality and Social Psychology, 71,* 746–762.

Staudinger, U. M., Bluck, S., & Herzberg, P. Y. (2003). Looking back and looking ahead: Adult age differences in consistency of diachronous ratings of subjective well-being. *Psychology and Aging, 18,* 13–24.

Staudinger, U. M., Dörner, J., & Mickler, C. (2005). *Self-insight: Measurement, validation and plasticity.* Manuscript in preparation.

Staudinger, U. M., & Fleeson, W. (1996). Self and personality in old and very old age: A sample case of resilience? *Development and Psychopathology, 8,* 867–885.

Staudinger, U. M., Freund, A. M., Linden, M., & Maas, I. (1999). Self, personality, and life management: Psychological resilience and vulnerability. In P. B. Baltes & K. U. Mayer (Eds.), *The Berlin Aging Study: Aging from 70 to 100* (pp. 302–328). New York: Cambridge University Press.

Staudinger, U. M., & Kunzmann, U. (2005). Positive adult personality development: Adjustment and/or growth? *European Psychologist, 10,* 320–329.

Staudinger, U. M., & Lindenberger, U. (Eds.). (2003). *Understanding human development: Life span psychology in exchange with other disciplines.* Boston: Kluwer Academic.

Staudinger, U. M., Lopez, D., & Baltes, P. B. (1997). The psychometric location of wisdom-related performance: Intelligence, personality, and more? *Personality and Social Psychology Bulletin, 23,* 1200–1214.

Staudinger, U. M., Maciel, A. G., Smith, J., & Baltes, P. B. (1998). What predicts wisdom-related performance? A first look at personality, intelligence, and facilitative experiential contexts. *European Journal of Personality, 12,* 1–17.

Staudinger, U. M., Marsiske, M., & Baltes, P. B. (1993). Resilience and levels of reserve capacity in later adulthood: Perspectives from life span theory. *Development and Psychopathology, 5,* 541–566.

Staudinger, U. M., Marsiske, M., & Baltes, P. B. (1995). Resilience and reserve capacity in later adulthood: Potentials and limits of development across the life span. In D. Cicchetti & D. Cohen (Eds.), *Developmental psychopathology: Vol. 2. Risk, disorder, and adaptation* (pp. 801–847). New York: Wiley.

Staudinger, U. M., & Pasupathi, M. (2000). Life span perspectives on self, personality, and social cognition. In F. I. M. Craik & T. A. Salthouse (Eds.), *The handbook of aging and cognition* (2nd ed., pp. 633–688). Mahwah, NJ: Erlbaum.

Staudinger, U. M., & Schindler, I. (2005). *Personal life investment: A window on adaptation across the life span.* Manuscript submitted for publication.

Staudinger, U. M., Smith, J., & Baltes, P. B. (1992). Wisdom-related knowledge in a life review task: Age differences and the role of professional specialization. *Psychology and Aging, 7,* 271–281.

Sternberg, R. J. (1985). *Beyond IQ: A triarchic theory of human intelligence.* New York: Cambridge University Press.

Sternberg, R. J. (1998). A balance theory of wisdom. *Review of General Psychology, 2,* 347–365.

Sternberg, R. J. (2004). Words to the wise about wisdom? *Human Development, 47,* 286–289.

Sternberg, R. J., & Jordan, J. (Eds.). (2005). *A handbook of wisdom: Psychological perspectives.* New York: Cambridge University Press.

Sternberg, R. J., Wagner, R. K., Williams, W. M., & Horvath, J. A. (1995). Testing common sense. *American Psychologist, 50,* 912–927.

Sterns, H. L., & Dorsett, J. G. (1994). Career development: A life span issue. *Experimental Aging Research, 20,* 257–264.

Strelau, J., & Angleitner, A. (Eds.). (1991). *Explorations in temperament: International perspectives on theory and measurement.* New York: Plenum Press.

Suls, J., & David, J. P. (1996). Coping and personality: Third time's the charm? *Journal of Personality, 64,* 993–1005.

Suls, J., David, J. P., & Harvey, J. H. (1996). Personality and coping: Three generations of research. *Journal of Personality, 64,* 711–735.

Taylor, S. E., & Brown, J. D. (1988). Illusion and well-being: A social psychological perspective on mental health. *Psychological Bulletin, 103,* 193–210.

Taylor, S. E., & Gollwitzer, P. M. (1995). Effects of mindset on positive illusions. *Journal of Personality and Social Psychology, 69,* 213–226.

Taylor, S. E., Neter, E., & Wayment, H. A. (1995). Self-evaluation processes. *Personality and Social Psychology Bulletin, 21*(12), 1278–1287.

Tetens, J. N. (1777). *Philosophische Versuche über die menschliche Natur und ihre Entwicklung.* Leipzig, Germany: Weidmanns Erben und Reich.

Thaler, D. S. (2002). Design for an aging brain. *Neurobiology of Aging, 23,* 13–15.

Thelen, E., & Smith, L. B. (1998). Dynamic systems theories. In W. Damon (Editor-in-Chief) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (pp. 563–635). New York: Wiley.

Thomae, H. (1959). *Entwicklungspsychologie* [Developmental psychology]. Göttingen, Germany: Hogrefe & Huber.

Thomae, H. (Ed.). (1979). The concept of development and life span developmental psychology. In P. B. Baltes & O. G. Brim Jr. (Eds.), *Life span development and behavior* (Vol. 2, pp. 282–312). New York: Academic Press.

Tomasello, M. (1999). *The cultural origins of human cognition.* Cambridge, MA: Harvard University Press.

Tomarken, A. J., Davidson, R. J., Wheeler, R. E., & Kinney, L. (1992). Psychometric properties of resting anterior EEG asymmetry: Temporal stability and internal consistency. *Psychophysiology, 29,* 576–592.

Trivers, R. L. (1985). *Social evolution.* Menlo Park, CA: Benjamin/Cummings.

Turkheimer, E., Haley, A., Waldron, M., D'Onofrio, B., & Gottesman, I. I. (2003). Socioeconomic status modifies heritability of IQ in young children. *Psychological Science, 14*(6), 623–628.

Vaidya, J. G., Gray, E. K., Haig, J., & Watson, D. (2002). On the temporal stability of personality: Evidence for differential stability and the role of life experience. *Journal of Personality and Social Psychology, 83,* 1469–1484.

Vaillant, G. E. (1990). Avoiding negative life outcomes: Evidence from a forty-five year study. In P. B. Baltes & M. M. Baltes (Eds.), *Successful aging: Perspectives from the behavioral sciences* (pp. 332–355). New York: Cambridge University Press.

Vaillant, G. E. (1993). *The wisdom of the ego.* Cambridge, MA: Harvard University Press.

Valsiner, J., & Lawrence, J. A. (1997). Human development in culture across the life span. In J. W. Berry, P. R. Dasen, & T. S. Saraswathi (Eds.), *Handbook of cross-cultural psychology* (Vol. 2, pp. 69–106). Boston: Allyn & Bacon.

Verhaeghen, P., Marcoen, A., & Goossens, L. (1992). Improving memory performance in the aged through mnemonic training: A meta-analytic study. *Psychology and Aging, 7,* 242–251.

Verhaeghen, P., & Salthouse, T. A. (1997). Meta-analyses of age-cognition relations in adulthood: Estimates of linear and nonlinear age effects and structural models. *Psychological Bulletin, 122,* 231–249.

Vygotsky, L. S. (1962). *Thought and language.* Cambridge, MA: MIT Press.

Waddington, C. H. (1975). *The evolution of an evolutionist.* Edinburgh, Scotland: Edinburgh University Press.

Waterman, A. S., & Archer, S. L. (1990). A life span perspective on identity formation: Developments in form, function, and process. In P. B. Baltes, D. L. Featherman, & R. M. Lerner (Eds.), *Life span development and behavior* (Vol. 10, pp. 29–57). Hillsdale, NJ: Erlbaum.

Weinert, F. E., & Perner, J. (1996). Cognitive development. In D. Magnusson (Ed.), *The life span development of individuals: Behavioural, neurobiological and psychosocial perspectives* (pp. 207–222). Cambridge, England: Cambridge University Press.

Weir, M. W. (1964). Developmental changes in problem-solving strategies. *Psychological Review, 71,* 473–490.

Welford, A. T. (1984). Between bodily changes and performance: Some possible reasons for slowing with age. *Experimental Aging Research, 10,* 73–88.

Wellman, H. M. (2003). Enablement and constraint. In U. M. Staudinger & U. Lindenberger (Eds.), *Understanding human development: Dialogues with life span psychology* (pp. 245–263). Boston: Kluwer Academic.

Werner, E. E. (1995). Resilience in development. *Current Directions in Psychological Science, 4,* 81–85.

Werner, H. (1926). *Einführung in die Entwicklungspsychologie.* München, Germany: Barth.

Werner, H. (1948). *Comparative psychology of mental development.* New York: International Universities Press.

Whitbourne, S. K. (1987). Personality development in adulthood and old age: Relationships among identity style, health, and well-being. *Annual Review of Gerontology and Geriatrics, 7,* 189–216.

Whitbourne, S. K., & Waterman, A. S. (1979). Psychosocial development during the adult years: Age and cohort comparisons. *Developmental Psychology, 15,* 373–378.

White, R. W. (1959). Motivation reconsidered: The concept of competence. *Psychological Review, 66,* 297–333.

White, S. H. (1992). G. Stanley Hall: From philosophy to developmental psychology. *Developmental Psychology, 28,* 25–34.

Wiese, B. S., Freund, A. M., & Baltes, P. B. (2002). Subjective career success and emotional well-being: Longitudinal predictive power of selection, optimization and compensation. *Journal of Vocational Behavior, 60,* 321–335.

Wiese, B. S., & Schmitz, B. (2002). Studienbezogenes Handeln im Kontext eines entwicklungspsychologischen Meta-Modells. *Zeitschrift für Entwicklungspsychologie und Pädagogische Psychologie, 34,* 80–94.

Wilkening, F., & Anderson, N. H. (1990). Representation and diagnosis of knowledge structures in developmental psychology. In N. H. Anderson (Ed.), *Contributions to information integration theory* (pp. 45–80). Hillsdale, NJ: Erlbaum.

Willis, S. L. (1990). Contributions of cognitive training research to understanding late life potential. In M. Perlmutter (Ed.), *Late-life potential* (pp. 25–42). Washington, DC: Gerontological Society of America.

Willis, S. L. (2001). Methodological issues in behavioral intervention research with the elderly. In J. E. Birren (Ed.), *Handbook of the psychology of aging* (5th ed., pp. 78–108). San Diego, CA: Academic Press.

Willis, S. L., & Baltes, P. B. (1980). Intelligence in adulthood and aging: Contemporary issues. In L. W. Poon (Ed.), *Aging in the 1980's: Psychological issues* (pp. 260–272). Washington, DC: American Psychological Association.

Willis, S. L., & Nesselroade, C. S. (1990). Long-term effects of fluid ability training in old-old age. *Developmental Psychology, 26,* 905–910.

Wood, J. V. (1996). What is social comparison and how should we study it? *Personality and Social Psychology Bulletin, 22,* 520–537.

Woodruff, D. S., & Birren, J. E. (1972). Age changes and cohort differences in personality. *Developmental Psychology, 6,* 252–259.

Wortman, C. B., & Silver, R. C. (2001). The myths of coping with loss revisited. In M. S. Stroebe & R. O. Hansson (Eds.), *Handbook of bereavement research: Consequences, coping, and care* (pp. 405–429). Washington, DC: American Psychological Association.

Yates, E., & Benton, L. A. (1995). Biological senescence: Loss of integration and resilience. *Canadian Journal on Aging, 14,* 106–120.

Zuckerman, M. (1995). Good and bad humors: Biochemical bases of personality and its disorders. *Psychological Science, 6,* 325–332.

CHAPTER 12

The Life Course and Human Development

GLEN H. ELDER JR. and MICHAEL J. SHANAHAN

THE EMERGENCE OF LIFE-COURSE THEORY: A HISTORICAL ACCOUNT 668
Concepts of Human Development across the Life Span 670
How Lives Are Socially Organized: Roles, Cycles, and Age 672
Age and Life Course 673
BASIC CONCEPTS AND PERSPECTIVES OF THE INDIVIDUAL LIFE COURSE 679
Social Pathways, Cumulative Processes, and the Individual Life Course 680
Trajectories, Transitions, and Turning Points 684
Selection, Endogeniety, and Contextual Effects 687
LIFE TRANSITIONS AND HISTORICAL CHANGE 689
Linking Mechanisms 689
Paradigmatic Principles of Life-Course Theory 691
Contributions of Life-Course Theory to the Study of Human Development 700
INTEGRATING BIOLOGICAL MODELS WITH THE LIFE COURSE: A PROMISING FRONTIER 701
Mechanisms of Gene-Environment Interaction 702
Gene-Environment Interactions in the Life Course 703
Future Directions for the Life Course and Behavioral Genetics 705
CONCLUSIONS 706
REFERENCES 707

The study of the life course and human development flourished during the closing decades of the twentieth century, extending across substantive and theoretical boundaries (Mortimer & Shanahan, 2003), and now appears in many subfields of the behavioral sciences. With this change has come an increasing appreciation for linkages between changing contexts and human development. *Context* refers to the social embedding of individuals and often calls for the study of longitudinal, historical, and spatial variations. *Human development* entails patterns of growth and adaptation that extend from birth to death.

Conceptual breakthroughs associated with the life-course framework, coupled with the dramatic growth of longitudinal studies, have generated more research and knowledge than ever before about behavioral adaptations in real-world settings. We are also increasingly aware of individuals as agents of their own lives. New avenues of research have opened, and the future offers exciting promise for understanding how dynamic views of context and the person—including biological dimensions—interact to influence achievements, physical and psychological well-being, and social involvements.

To grasp the magnitude of this change, consider studies of person and society in the 1960s. In his widely read *The Sociological Imagination,* C. Wright Mills (1959) encouraged "the study of biography, of history, and of the problems of their intersection within social structure" (p. 149). Mills started with the individual and asked what features of society produce such a person. He argued that the seemingly "personal problems" of one's biography are better understood as repercussions of broad social tensions. He had few empirical examples, however, and was not concerned with dynamic views of person and context. Rather, he focused on types of society and adult behavioral patterns, with little recognition of social change, development and aging, or even human diversity. Indeed, longitudinal studies of human lives

We thank Ross Parke, Avshalom Caspi, and Richard Lerner, who provided thoughtful reviews to the first edition of this chapter (Elder, 1998a). The senior author is indebted to the Spencer Foundation for a Senior Scholar Fellowship. The staff of the Carolina Population Center provided valuable assistance in preparing the first and second editions of the chapter. We are particularly indebted to Lilly Shanahan for her thorough review of the second edition.

were an uncommon subject of study, particularly in their social and historical contexts. The concept of the life course had not yet appeared in the scholarly literature and was not addressed in the seminars of leading graduate programs.

The unfolding story of life-course theory up to the present owes much to a set of pathbreaking studies that were launched more than 60 years ago at the Institute of Child Welfare (now Human Development) at the University of California in Berkeley: the Oakland Growth Study (birth years 1920 to 1921) and the Berkeley Growth and Guidance Studies (birth years 1928 to 1929). When these studies began, no one could have imagined what they eventually would mean for the field of human development. The investigators did not envision research that would extend into the adult years of study members, let alone into the later years of old age. There were many reasons for this limited perspective. Except for support from the Laura Spelman Rockefeller Foundation, substantial funds for longitudinal studies were virtually nonexistent. In addition, the idea of adult development had not yet captured the attention of behavioral scientists. A mature field of adult development and aging was still decades away from becoming a reality.

Nonetheless, these considerations did not restrict the studies from continuing into the adult years and middle age. The Institute of Human Development contacted the members of the Oakland Growth Study for interviews in the early and late 1950s, and another follow-up, scheduled in 1972 to 1973, joined the lives of all study members, some parents, and offspring, in an intergenerational framework.

By the 1970s, Jack Block (1971), with the assistance of Norma Haan, had completed a pioneering longitudinal study focused on continuity and change in personality from early adolescence to the middle years in the lives of the Oakland and Berkeley Study members. Also during the 1970s, George Vaillant (1977) followed a panel of Harvard men (students recruited between 1939 and 1942) into the middle years of adulthood, assessing mechanisms of defense and coping. Another study at the Institute of Human Development (Elder, 1974/1999) placed the lives of the Oakland Growth Study members in the Great Depression and traced the influence of hardship on family life, careers, and health up to midlife. To cap off this active decade, investigators at the Berkeley Institute completed a multifaceted study that revealed patterns of continuity and change in social roles, health, and personality, with a distinctive emphasis on life patterns across the middle years (Eichorn, Clausen, Haan, Honzik, & Mussen, 1981). Both historical cohort comparisons and intergenerational connections were part of this project.

At Stanford University, a research team headed by Robert Sears actively followed members of the Lewis Terman sample of talented children into their later years. This was the oldest, active longitudinal study at the time, with birth years extending from 1903 to the 1920s. By the 1990s, the project had assembled 13 waves of data spanning 70 years (Holahan & Sears, 1995), and research had begun to reveal the historical imprint of the times on the study members' lives (Elder, Pavalko, & Hastings, 1991), from the 1920s to the post World War II years and into later adulthood (Crosnoe & Elder, 2004; Shanahan & Elder, 2002).

This extension of the early child samples to the adult years provided initial momentum to the scientific study of adult development and sharpened awareness of the need for a different research paradigm that would give attention to human development beyond childhood and to contexts beyond the family. What social routes to adulthood promoted behavioral continuity or change from the early years of life? Which ones enabled problem children to turn their lives around and become effective adults? Child-based models of development had little to offer because they did not address development and aging in the adult life course and were not concerned with changing social contexts. For the most part, studies of continuity and change from childhood to the adult years were limited to evidence of correlational patterns between measures at time 1 and time 2 (Jones, Bayley, Macfarlane, & Honzik, 1971). The intervening years and their mechanisms remained a "black box." Little, if anything, could be learned about linking events and processes from such analysis.

Kagan and Moss (1962), for example, studied the Fels children from "birth to maturity" by using correlation coefficients to depict behavioral stability across the years, but this approach ignored the diverse paths that youth take into adult life. By age 23, some of the respondents followed a path to college, full-time employment, and marriage, and others entered military service or mixed employment and education. The timing of such transitions was important in determining their meaning and implications. For example, adolescent marriage and parenting are coupled with more social and economic

constraints than the same transitions occurring according to a normative timetable, but late family formation maximizes economic advantages and minimizes the disruptive effect of young children. However, these considerations of context and timing—so richly descriptive of lives—were of little interest. In large part, this inattention reflected the view that continuity of behaviors and psychological dispositions required little explanation aside from the label "stability."

Empirical studies of children into their adult and midlife years revealed major limitations to conventional knowledge of human development, which, in turn, posed major challenges for the future study of behavior:

- To replace child-based, growth-oriented ("ontogenetic") accounts of development with models that apply to development and aging over the life course
- To think about how human lives are organized and evolve over time, exhibiting patterns of constancy and change
- To relate lives to an ever-changing society, with emphasis on the developmental effects of social change and transitions

As a whole, these challenges revealed a view of human development that was advocated by proponents of a contextualized psychology (e.g., Cairns & Cairns, Chapter 3, this *Handbook,* this volume) and many decades earlier by the Chicago school of sociology (Abbott, 1997), especially by William I. Thomas. With the close of the nineteenth century and through the first decades of the twentieth century (a time of massive changes in U.S. society), Thomas made a persuasive case for studying change as "experiments of nature" in the lives of immigrants and children. Inspired by Thomas and Znaniecki's *The Polish Peasant in Europe and America* (1918–1920), researchers began to use life-record data to investigate the impact of social change. Before most of the innovative longitudinal studies had been launched, Thomas urged, in the mid 1920s, that priority be given to the "longitudinal approach to life history" (Volkart, 1951, p. 593). He claimed that studies should investigate "many types of individuals with regard to their experiences and various past periods of life in different situations" and follow "groups of individuals in the future, getting a continuous record of experiences as they occur."

Social transformations of the twentieth century raised many questions about historical variations in family life and contexts beyond the family, including schools and communities. In the classic Middletown studies (Lynd & Lynd, 1929, 1937), findings on families during the 1920s seemed to have little relevance to family life in the Great Depression. Life-course theory emerged in the 1960s in response to these issues and to the challenge of an aging population and the rapid growth of longitudinal studies. In the terminology of this chapter, the *life course* refers most broadly to a theoretical orientation (or paradigm) that encourages the study of changing lives in changing contexts. To use Robert Merton's (1968) distinction, a *theoretical orientation* establishes a common field of inquiry by defining a framework that guides research in terms of problem identification and formulation, variable selection and rationales, and strategies of research design and analysis.

Based in large measure on sociocultural theories of age and social relations (Elder, 1975; Neugarten, 1968; Ryder, 1965), the life course as a *concept* refers to a sequence of socially defined, age-graded events and roles that defines, in large measure, the contours of biography. A sociocultural perspective gives emphasis to the social meanings of age. Birth, puberty, and death are biological facts, but their meanings in the life course are social facts or constructions. Age distinctions are expressed in expectations about the timing and order of a transition, whether early, on time, or late. The life course can be historically linked to specific transitions and to the meanings of cohort status (Riley, Johnson, & Foner, 1972). Birth year locates people in specific birth cohorts and thus according to particular social changes.

The first author encountered such ideas about age and life course in the 1960s, just after arriving at the Institute of Human Development (UC Berkeley, 1962) to work with sociologist John Clausen on the Oakland Growth Study. The dramatic changes of families and individual lives across the 1930s focused his energies on the patterning of lives and links to a changing socioeconomic system. Codes that captured trajectories were needed for people's lives instead of the conventional codes for status at one point in time such as family socioeconomic status (SES) and personal achievement or failure. The link between age and time provided an important step in this direction such as age-patterned events. This perspective on life changes suggested a way of thinking about the social construction of individual lives, along with ideas from the life-history tradition of the early Chicago School of Sociology. Thus, *Children of the Great Depression* (Elder, 1974/1999) represents the

published version of this initial effort to fashion a life-course framework.

Since its inception, life-course studies have expanded their purview beyond historical variations to include dynamic patterns of context in cohorts. These studies reveal remarkable diversity in cohorts with respect to poverty experiences and economic fortunes, residential mobility and the composition of neighborhoods, family structure and household membership, and experiences shaped by diverse stressors, employment patterns, and immigration (Shanahan, Sulloway, & Hofer, 2000). Each life is marked by social change in these respects, and the life-course framework has proved useful in studying how these dynamisms shape lives and how the social aggregate of individual life patterns affect social institutions.

We begin this chapter by viewing the emergence of life-course thinking as a response to some of the challenges we have noted, particularly those that stem from following children into middle and old age. Life-span ideas in developmental psychology, life-cycle theory of role sequences, and concepts of the age-graded life course were prominent in this conceptual enterprise. By the end of the 1970s, a new synthesis, relating theory on relationships and age, achieved a theoretical orientation.

The basic concepts and distinctions of life-course theory are surveyed in the next section, with emphasis on the individual life course, its institutionalized pathways, developmental trajectories, and transitions. In addition, paradigmatic themes of life-course theory are identified and illustrated by research projects. The themes include human agency and choice making in the construction of lives, the timing of lives, linked or interdependent lives, and human lives in historical time and place. This account explores distinctive contributions of life-course theory to studies of children, adolescents, and young adults. The concluding section features newly emerging developments in life-course study, with an emphasis on biological perspectives, and a promise of a theoretical framework that combines biology, social and cultural influences, and psychology.

THE EMERGENCE OF LIFE-COURSE THEORY: A HISTORICAL ACCOUNT

Over the past 30 years, advances in life-course theory and research have come from many quarters across the behavioral and social sciences, identifying important problems and defining approaches from sociology (Elder, 1974/1999, 1975, 1985; Riley et al., 1972), demography (Ryder, 1965), history (Hareven, 1978, 1982; Modell, 1989), anthropology (Kertzer & Keith, 1984), and both ecological (Bronfenbrenner, 1979) and life-span developmental psychology (Baltes & Baltes, 1990). Major examples include:

- Recognition of a life-course perspective on human development, extending from birth to maturity, and the rapid growth of longitudinal studies that link childhood and the adaptations of later life (Phelps, Furstenberg, & Colby, 2002; Young, Savola, & Phelps, 1991).
- Life-history calendars for the collection of retrospective accounts of life events (Caspi et al., 1996; Freedman, Thornton, Camburn, Alwin, & Young-DeMarco, 1988).
- New appreciation for the necessity of longitudinal, contextually rich data (Hofer & Sliwinski, 2002; Little, Bovaird, & Marquis, in press); appropriate statistical techniques; and structural and dynamic, person- and variable-centered approaches (e.g., Bergman, Magnusson, & El-Khouri, 2003; Collins & Sayer, 2001; Little, Schnabel, & Baumert, 2000).
- Cross-disciplinary models of collaboration (Elder, Modell, & Parke, 1993), particularly with psychology and history, but now extending to exciting developments in subfields devoted to the study of physical and emotional well-being (Halfon & Hochstein, 2002; Hertzman & Power, 2003; Kuh, Ben-Shlomo, Lynch, Hallqvist, & Power, 2003). This chapter draws liberally from these sources in exploring the relevance of contemporary progress for studies of child, adolescent, and adult development.
- A growing awareness that, beyond history and the differing experiences of cohorts, social change may refer to dynamic contextual patterns experienced *within* cohorts through diverse life histories (Shanahan et al., 2000). Further, many contextual features are correlated, and their synergistic interactions are critical to understanding time and place.

As is seen, these developments have relevance for the study of the individual life course, its relation to changing social and historical conditions, and its implications for developmental processes. In this respect, life-course theory has much in common with interactionist think-

ing—which emphasizes interactions between person and context (see Magnusson & Stattin, Chapter 8, this *Handbook,* this volume)—but it also attends to the organization and reorganization of social structures and pathways through life. As might be expected, life-course theory shares many objectives and concepts with the ecology of human development (Bronfenbrenner, 1979; Bronfenbrenner & Morris, Chapter 14, this *Handbook,* this volume), including a multilevel concept of the environment, from micro to macro. Life-course models also share the ambition of life-span developmental psychology in rethinking the nature of human development and aging (Baltes, 1994; Baltes, Lindenberg, & Staudinger, Chapter 11, this *Handbook,* this volume), but with particular attention to links between changing contexts and lifelong development.

The principal traditions that led to life-course theory are illustrated in Figure 12.1: life-span concepts of development, social relations, and age and temporality.

The first strand (life-span concepts of human development) includes references to the pioneering work of Erik Erikson's (1950, 1963) psychosocial stages of development and Paul Baltes's (1997) process of selective optimization with compensation. In addition, Richard Lerner (1982, 1991) has stressed the relative plasticity and agency of the aging organism (see also Schaie, 1965, with emphasis on the later years of aging), the multidirectionality of life-span development, and the lifelong interaction of person and social context. The concept of developmental task, perhaps first delineated by Robert Havighurst (1949), also represents a way of viewing development across life stages. The concept alerts the analyst to the possibility that specific experiences may be highly salient at different points in life, although empirical evidence for distinct psychosocial stages is not compelling. The perceived or defined life course can change with aging through successive life reviews in which the past is assessed in light of the present. Staudinger (1989) has focused on "life review" as a way of studying intellectual development across the life span.

The second strand (social relations) includes the early work of W. I. Thomas on life histories (Thomas & Znaniecki, 1918–1920), G. H. Mead on socialization and the self (1934), Everett Hughes on work and the self (1971), Kurt Lewin on power dependence relations (1948), and L. S. Vygotsky on language, the self, and social relationships (1978; see also Clausen, 1968; Parke, Ornstein, Rieser, & Zahn-Waxler, 1994). The development of social role and self theories belongs in this tradition, and features the writings of sociologist Robert

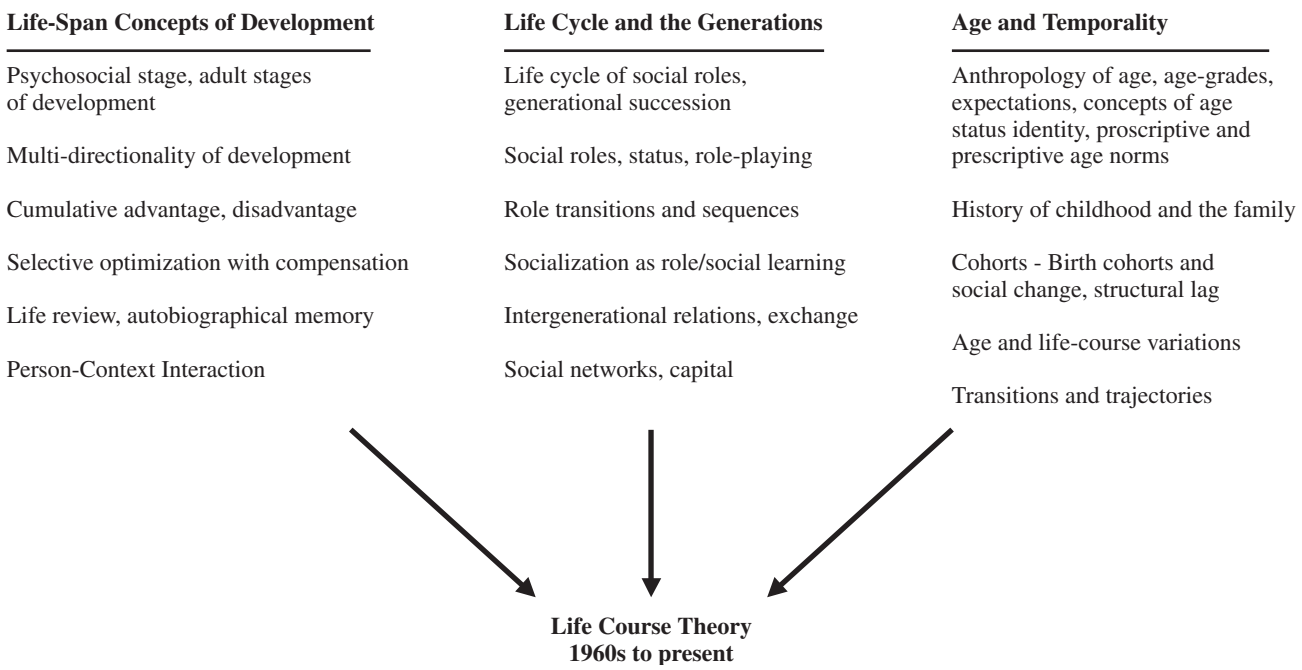

Life-Span Concepts of Development
Psychosocial stage, adult stages of development
Multi-directionality of development
Cumulative advantage, disadvantage
Selective optimization with compensation
Life review, autobiographical memory
Person-Context Interaction
Life Cycle and the Generations
Life cycle of social roles, generational succession
Social roles, status, role-playing
Role transitions and sequences
Socialization as role/social learning
Intergenerational relations, exchange
Social networks, capital
Age and Temporality
Anthropology of age, age-grades, expectations, concepts of age status identity, proscriptive and prescriptive age norms
History of childhood and the family
Cohorts - Birth cohorts and social change, structural lag
Age and life-course variations
Transitions and trajectories
Life Course Theory
1960s to present

Figure 12.1 The emergence of life-course theory (1960s to present): research traditions and their concepts.

Merton on role sets and reference groups (1968), Morris Rosenberg (1979) on self-esteem, and Urie Bronfenbrenner on socialization (1970), to name a few. The field of intergenerational relations has expanded from two to three and even four generations, with important contributions to an understanding of three generations from Reuben Hill (1970), Vern Bengtson and Laufer (1974), James Jackson (2000) and his three-generation study of African Americans, and Ross Parke (Parke & Ladd, 1992).

A number of topics illustrate distinctive contributions to a third strand (the study of age and temporality in lives). These include the early contributions to age-grading by social and cultural anthropologists and the pioneering analysis of birth cohorts and generational units by Karl Mannheim in the 1920s (Elder, 1975). Also covered is Bernice Neugarten's work on the social psychology of age and the innovative sociological contributions of Matilda Riley and her collaborators. Demographers Uhlenberg (1974) and Hogan (1981) have produced creative analyses of cohort life patterns and age-grading. In social history, Hareven (1978, 1982) and Modell (1989), among others, have made imaginative contributions to a historical understanding of the life course. The study of age expectations and timetables in adolescent development is nicely illustrated by Silbereisen's programmatic study of youth affected by German reunification (e.g., Silbereisen & Schmitt-Rodermund, 1995; Silbereisen & Wiesner, 2000, 2002).

We turn now to a survey of each strand of influence on life-course theory.

Concepts of Human Development across the Life Span

A number of efforts in the psychological sciences were made during the post-World War II years to link child and adult developmental trajectories to social structure and changes in society, though typically from the perspective of a maturing or aging organism. Research questions did not ask about the implications of environmental change for the developing individual. Erik Erikson's (1950, 1963) theory of psychosocial stages was formulated with an eye to cultural variations, but he also largely saw the social system and culture from the vantage point of the developing organism. Likewise, Daniel Levinson's (1978) *The Seasons of a Man's Life* outlined a theory of life structure that ignored variations in social structure and culture over historical time in which psychosocial transitions were affixed to age as if immutable to institutional change, such as the midlife transition between ages 40 and 45. For Erikson, Levinson, and other ontogenetic theorists, the starting point was a sequence of stages through which all persons must pass.

This perspective views the social context as a "scene or setting" through which the person—loaded with his or her "natural predispositions"—must pass. By contrast, the life-course paradigm views the interplay of social context and the organism as the formative process, making people who they are. Individuals do not "develop according to their natures" but, rather, they are continually produced, sustained, and changed by their social context (see Gottlieb, Wahlsten, & Lickliter, Chapter 5, this *Handbook,* this volume). Indeed, Mitterauer (1993) observes that, in many times and places, historians find little evidence of Erikson's stages.

Proponents of life-span developmental psychology (a field of inquiry first identified by name in 1969) addressed the challenges of such a circumscribed view by seeking a concept of development and aging across the life span that emphasizes cultural influences and learned experiences or skills in patterns of aging. In theory, historical and cultural variations emerged as particularly influential sources of adult adaptations and development. As Baltes (1979) observed, "It appears that restricting developmental events to those which have the features of a biological growth concept of development is more of a hindrance than a help" (p. 265).

Paul Baltes (1993, 1994) has been a major figure in the conceptual articulation of life-span development since the 1960s. More than most proponents of this perspective, he has interacted with life-course ideas and distinctions over the decades (see Baltes et al., Chapter 11, this *Handbook,* this volume). The following propositions on life-span development are not new in themselves but they add up to a distinctive perspective:

- Life-span development results from lifelong adaptive processes in which some are cumulative and continuous, and others are discontinuous and innovative, showing little connection to prior events or processes.
- Ontogenetic development is local, specific, and time-bound, so it is never fully adaptive. There is no pure advance or loss in development.
- Age-graded influences are most important in the dependency years, childhood/adolescence and old age,

but history-graded and nonnormative influences are most consequential across the early and middle years of adulthood.

- Changes occur in relation to positive and negative events, gains, and losses, with the likelihood of expected losses increasing. Biological resources decline over the life span, but cultural resources may increase such as the cultivation of wisdom.
- Life-span development entails *selection, optimization,* and *compensation.* These mechanisms seek to maximize gains and minimize losses or declines. Selective optimization with compensation represents a "life-span model of psychological management that describes how individuals can deal with the dual faced nature of human aging and the ubiquitous, age-related shift toward a less positive balance of gains and losses" (Baltes, 1993, p. 590).

The way these mechanisms or strategies work in later life is illustrated by an interview with the concert pianist Arthur Rubenstein. When asked how he remained a successful pianist in his late years, Rubenstein referred to three strategies: "(1) he performed fewer pieces, (2) he now practiced each more frequently, and (3) he introduced more ritardandos in his playing before fast segments, so that the playing sounded faster than it was" (Baltes, 1993, p. 590). The strategy of selection is illustrated by Rubenstein's concentration on fewer pieces, the more frequent practice illustrates the use of optimization, and the increasing reliance on contrast in speed exemplifies a strategy of compensation.

This psychological model of successful aging has relevance for successful development at all ages including childhood and adolescence. Adaptations in adolescence can be viewed through the guidelines of selective optimization in which gains are maximized and risks, losses, or deprivations are minimized. Youth select activities in which they are competent (i.e., athletics, academics, or street life) and optimize benefits through an investment of resources, time, energy, and relationships. Marsiske, Lang, Baltes, and Baltes (1995, pp. 35–36) rightly claim that selective optimization with compensation is best understood as a metamodel for life-span development because it applies broadly to aspects of the "developmental person-context matrix." Life-span developmentalists, such as Baltes, Schaie, and others, have undoubtedly enriched our thinking about development and aging across the life course, and they have given some attention to the role of social, cultural, and historical forces in developmental processes.

However, concepts of life-span development generally fail to apprehend social structure as a constitutive force in development. The problem stems from the life-span framework's conceptualization of context, which refers to age-graded, history-graded, or nonnormative influences: Age-graded influences shape individual development in largely normative ways for all persons, history-graded influences shape development in different ways for different cohorts, and nonnormative influences reflect idiosyncrasies (e.g., losing a leg in an accident). Such a view has been unduly restrictive in two senses. First, within-cohort variability largely reflects nonnormative influences, which are not easily subject to scientific study (Dannefer, 1984). As a result, the social basis for within-cohort differences becomes a residual category. Second, as Mayer (2003) has noted, life-span psychology views historical and nonnormative influences as idiographic (i.e., unique, nonrepeating), leaving only age-graded influences, which are thought to be largely based in biology and age norms.

Because the larger social forces that lead to age norms are of little interest, within-cohort regularities in behavior are explained solely by personal attributes (biology and internalized norms). In the final analysis, the study of contextual influences in cohorts is hampered because it produces largely invariant patterns through such age-graded influences, or it cannot be studied because of its seemingly random nature. Despite these conceptual difficulties, life-span studies are beginning to investigate links between broader social contexts and individual functioning (e.g., Heckhausen, 1999).

The important issue to recognize is that there is not one optimum *point of entry* for studying human development across the life span (see also Shanahan & Porfeli, 2002). Indeed, the multilevel nature of human development invites different points of entry (each with specific research questions) ranging from cultures and social institutions to the human organism. Entry points frequently link or cross adjacent levels in the developmental process. Studies commonly employ different entry points in the same research, although framed by a central question. Thus, a project motivated by the impact of rural change on children's social and emotional development should be framed by an initial focus on some aspect of this social process such as the degree of economic hardship and displacement. Inquiry would explore

the process by which this change makes a difference in children's developmental experience. Parts of this study might also investigate the determinants of specific emotional or social outcomes and relevant protective resources in the family, a point of entry that centers on the developmental status of the child. Still other entry points might begin with the interchange of parents and child or with sibling relationships. Each point could become a framing statement for an independent study.

How Lives Are Socially Organized: Roles, Cycles, and Age

The second column of Figure 12.1 refers to how an individual's life pattern is structured by multiple role sequences and their transitions. These transitions into and out of social roles across the life span entail both social and personal changes in status and identity (Glaser & Strauss, 1971). In their field studies, anthropologists have referred to a patterned role sequence from birth to death as a "life cycle" (Kertzer & Keith, 1984). Changes in major roles, such as from youth to marriage and parenthood, generally represent changes in a social stage across the life cycle.

In concept, the life cycle views life organization through social relationships, particularly kin relationships, and generational succession. A dominant concept of the life span from the early 1900s up to the 1960s, life cycle generally referred to a sequence of social roles among individuals and families. A more precise social meaning of life cycle is a sequence of stages in parenting, from the birth of children through their departure from the home to their own children. The role sequence refers to a reproductive process that always applies to human populations. In a life cycle of generational succession, newborns are socialized to maturity, give birth to the next generation, grow old, and die. The "cycle" is repeated from one generation to the next in a human population (O'Rand & Krecker, 1990).

Life cycles as reproductive cycles vary greatly in the pace of their revolutions. Early childbearing, shortly after menarche, accelerates the cycle and shortens the distance between the generations. When the eldest daughter has a child before the age of 13, her mother may become a grandmother before the age of 30 and a great-grandmother before the age of 50. A sequence of early childbearing across the generations weakens the generational and age basis for family authority and social control. By contrast, late childbearing slows the cycle and minimizes age similarities across adjacent generations. In a rapidly changing world, parents, grandparents, and children share less culture and historical experience.

The life cycle concept incorporates both socialization and social control processes. The predominant roles of a life stage lock people into a set of normative expectations and informal sanctions that provide direction and discipline. Commitments to a line of action arise over time through obligations to significant others (Becker, 1961, 1964). Stable role relationships ensure a measure of personal stability, just as entry into such relationships can stabilize a person's life and minimize involvement in unconventional and dangerous activities. Sampson and Laub (1993) observed, in their sample of men from a low-income urban sample, that adult bonds to conventional figures and lines of activity defined a route of escape from delinquency for a substantial number of men with a childhood history of delinquency and economic disadvantage.

During the familistic post-World War II years, the life cycle became well known as the *family cycle* through the writings of Paul Glick and Reuben Hill; a set of ordered stages of parenthood defined primarily by variations in family composition and size (Elder, 1978). Major transition points included courtship, engagement, marriage, birth of the first and last child, the children's transitions in school, departure of the eldest and youngest child from the home, and marital dissolution through the death of one spouse. Family life in this era provided a better fit to this sequence of roles than it does today. Marriage and parenting have been uncoupled to a considerable extent (Bumpass & Lu, 2000). Children are increasingly born prior to marriage or outside of marriage altogether. In the United States, the prevalence of divorce has led to multiple families in a person's life and to the likelihood that most children will experience a single parent household before they enter adulthood.

The life-cycle concept and its family-cycle version usefully knit together the full array of life stages and generations. They also provide insight into processes of socialization and social control over the life span that link the developing person and his or her career. And yet, the life cycle's focus on reproduction and parenting has limited value as a way of viewing the lives and developmental trajectories of children and adults because it does not apply to never married, nonparent, or divorced persons, all of whom have become increasingly common (e.g., Fussell, 2002). The focus on a single ca-

reer also ignores the realities of multiple careers, and each person generally occupies multiple roles at the same time (whether spouse and parent or spouse and employee), but these concurrent roles are not part of the life cycle's scope. Consequently, the life or family cycle did not orient research to the management or coordination of multiple roles such as marriage and work. By the end of the 1960s, a prime era for life-cycle research, a survey by Young and Willmott (1973) concluded that studies of work and family had proceeded along separate paths with no significant effort to examine their interdependencies. This contrasts rather strikingly today with the flourishing study (with an emphasis on interlocking trajectories) of work and family relations (Blair-Loy, 2003; Crouter, Maguire, Helms-Erikson, & McHale, 1999; Drobnic, Blossfeld, & Rohwer, 1999; Moen, 2003; van der Lippe & van Dijk, 2002).

In addition, the life cycle is insensitive to temporal location and matters of timing. The concept depicts a sequence of social roles and transitions. Social roles are ordered but are not temporally located in a person's life. In the case of the family cycle, for example, each stage of parenting could be arrayed in a sequence but would not be bound by age or the temporal markers that come with a perspective on the age-graded life course. A life-cycle model of a person's life might locate marriage before the first birth, but it would not indicate whether the marriage occurred at 20 or 40 years. Sequence models thus provide only part of the story on life context.

The kinship term of *generation* is part of a life-cycle perspective and shares its blindness to temporality. Members of an ancestral generation do not occupy a common historical location relative to events and long-range trends. A parent generation, for example, may have birth years that span 30 years, a period that could include eras of economic depression, global war, and peace in the twentieth century. The greater the time span, the more diverse the historical experience of the generation. With these points in mind, it is apparent that generational role or position cannot offer a precise way of connecting people's lives to the changes in society. Indeed, intergenerational studies are generally distinguished by their insensitivity to historical time or location; generations are frequently studied in the timeless realm of the abstract.

Temporal limitations of this kind are generally characteristic of models based on role theory. Ebaugh's study of role exits (1988) makes this limitation very clear. The concept of "role exit" involves a change of identity in terms of the new role and its predecessor, but Ebaugh makes no explicit reference to timing across the life span or to historical time. Judging from the analysis, one might conclude that it is not consequential whether an illness and death involves a child or a grandparent, whether family separation occurs in one's 20s or 50s, or whether a lay-off occurs at the beginning or the end of one's productive work life. On the contrary, the evidence suggests that timing matters because social timetables, age norms, and age-graded sanctions influence individuals.

In summary, role sequences and identity change, socialization and social control, the life-cycle perspective, and generations are conceptual elements of a *relationship* view of life patterns and organization that dates back to the nineteenth century. One of the earliest proponents of this view, sociologist W. I. Thomas, used life-record data to study the emigration of Polish peasants to European and U.S. cities around the turn of the century (Thomas & Znaniecki, 1918–1920). In this pioneering work, described as "the greatest single study done thus far by an American sociologist" (Nisbet, 1969, p. 316), the lives of immigrants embodied the discontinuities of the age; they were socialized for a world that had become only a memory. The societies they left and entered—the Old World and the New—presented contrasting *lines of genesis* or primary sequences of social roles for individual adaptation and development. Matters of social and historical time are clearly relevant to this project, and yet, Thomas and Znaniecki were largely insensitive to them.

For many years, the relationship and life-cycle perspective offered a valuable way of thinking about the social patterning and interdependence of lives, although limited in a number of respects. During the 1960s, this approach began to converge with new understandings of age to form life-course models that combined the virtues of both theoretical traditions: linked lives across the life span and generations, and temporality through an age-graded sequence of events and social roles, embedded in a changing world. In addition, these models were informed by life-span concepts of human development that underscored the agency of individuals in the social construction of their lives and life courses.

Age and Life Course

The importance of the 1960s in linking these theoretical traditions had much to do with the appearance of new

thinking about age, including an appreciation for its diverse meanings and consequences (see third column of Figure 12.1). These new thoughts include an emphasis on subjective experiences with the age structures of society and the individual's own construction of a life course, as expressed in the pioneering work of Bernice Neugarten (Neugarten, 1996; Neugarten & Datan, 1973). In the University of Chicago's Committee on Human Development, post-World War II studies, such as the Kansas City project, were more successful than other efforts at the time in linking human development through the adult years to the social structures in which people lived. For example, Neugarten and Peterson (1957) observed a relationship between age-linked concepts of self and life stage by socioeconomic position. Working-class people were older when they entered the self-defined middle years of life, compared to upper-status people. Neugarten contributed to this early work by connecting socioeconomic careers to adult psychology, role transitions, and generations. We return to these important contributions in the context of age-based perspectives on the life course. Through the innovative work of Norman Ryder (1965) and Matilda Riley (Riley et al., 1972), a more developed articulation of the relation between historical time and lives was proposed, as expressed through membership in age cohorts and successive age strata. For the first time, this work joined two relatively independent lines of research on age (Elder, 1975): (1) sociocultural and (2) cohort-historical.

Sociocultural Patterns in Human Experience

The relevance of age for a sociocultural understanding of life organization has evolved over many decades of ethnographic study by anthropologists, as in research on age-grading and age-set societies (Kertzer & Keith, 1984). This work has generally focused on age structures in culture; however, the new inquiry explored individual experiences of age and age-grading, giving fresh insights to the social and psychological variability of people's lives.

Contrary to a structural view of age patterns in cultures (Eisenstadt, 1956; Kertzer & Keith, 1984), studies began to show that people of the same age do not march in concert across major events of the life course; rather, they vary in the pace and sequencing of their transitions and they do so in ways that have real consequences for family pressures, child socialization, and personal well-being. This variation also appears in accounts of differential aging among people who follow different social trajectories.

During the late 1950s and early 1960s, Bernice Neugarten directed a research program that featured a concept of normative timetables and individual deviations from such expectations (Neugarten & Datan, 1973). The timetable of the life course refers to social age, as defined by people's expectations regarding events. In theory, age expectations specify appropriate times for major transitions, and violations of these expectations may lead to punitive responses from others. There is an appropriate time for entering school, leaving home, getting married, having children, and retiring from the labor force. Neugarten, Moore, and Lowe (1965) observed a high degree of consensus on age norms across some 15 age-related characteristics in samples of middle-class adults. The data reveal general agreement among men and women on the appropriate age for a woman to marry and support the hypothesis that informal sanctions are associated with relatively early and late marriage. Moreover, the women were aware if they were on time, late, or early with respect to marriage and other major role transitions.

Although subsequent studies have extended this line of research (Settersten & Mayer, 1997), relatively little is known about age expectations and their boundaries and related sanctions; thus, doubts have been raised about age norms (Marini, 1984). These topics deserve far more attention than they have received to date. Some notions about the proper phasing of the life course take the form of cognitive descriptions or predictions rather than normative accounts, whether prescriptive or proscriptive. However, the process by which these descriptions or age expectations are constructed, transmitted, and learned remains largely unexplored territory.

For many decades, age-grades or categories were inferred as possessing common significance without evidence of their meaning to the individuals involved. At what point do young children take the perspective of a student? When do young adults begin to take an adult standpoint and view themselves accordingly? Is the main transition point for an adult perspective marriage, the birth of a child, or stable employment? Such questions were of interest in Neugarten's research program, and she broke new ground in testing the proposition that life stage is partially a function of one's socioeconomic status and career.

In the mid-1950s, Neugarten found that men in the lower-economic strata were likely to perceive a more rapid passage through the major age divisions of life

than did middle-class men: Maturity, middle age, and old age come earlier at a lower-economic strata, owing perhaps to class-linked occupational demands and stresses (Neugarten & Peterson, 1957). The man who relies on mental skills in a sedentary occupation foresees a relatively long period of productivity, while the man who works with his hands expects a relatively short span of productive activity, followed by retirement. This research is one of the earliest contributions to what is now called a "constructionist perspective on the life course" with its emphasis on human agency and choice making.

Age distinctions order social roles (e.g., the sociocultural perspective of the Neugarten studies), but they also order people through age or birth cohorts. Cohorts have long been common to demographic research on marriage, fertility, and divorce. However, these cohort studies were not carried out with an interest in the life course.

Age Cohorts in Lives

Important theoretical work on the link between life patterns and changes in society began to appear in the 1960s, featuring Ryder's influential essay on "The Cohort as a Concept in the Study of Social Change." The most comprehensive pioneering work was authored by Matilda Riley and her colleagues in *Aging and Society* (Riley et al., 1972). Riley and her colleagues viewed age as a basis of stratification in historical experience and in role sequences across the life course. "Whereas socioeconomic strata are ranked to form a social hierarchy, age strata are typically ordered by time (hence, are more akin to geological strata)" (p. 23). Birth year indicates historical time, and chronological age acquires the meanings of social timing and life stage. Birth cohorts provide a link between historical change and the life course.

Birth year or date of entry into a system (such as school graduation or marriage) locates the individual according to historical time and related social changes: With age peers in the cohort, this person is exposed to a particular segment of historical experience as he or she moves across the sequence of age-graded roles. To grasp the meaning and implications of birth year and cohort membership, the analyst specifies the distinctive historical events and processes at the time, as well as characteristics of the cohort such as its size and composition. These characteristics are themselves a consequence of historical changes in birth and death rates, immigration, and migration.

Adjacent birth cohorts are most sharply differentiated during rapid change, and represent a vehicle of social change when cohort differences arise. As successive cohorts encounter the same historical event, they do so at different stages in their life course. This means that adjacent cohorts bring different life experiences to the change. Consequently, the impact of the event is contingent on the life stage of the cohort at the point of change. Ryder (1965) stressed this "life-stage principle" in his account of cohort differences in the life course. As each cohort encounters a historical event, whether depression or prosperity, it "is distinctively marked by the career stage it occupies" (p. 846). Examples include the differential age of military entry among U.S. veterans who served in World War II. The age range spanned 20 years: Some recruits had just left high school while others were in their mid-30s with families and careers.

From this vantage point, historical influence in life experience can take different forms in cohort studies. One form is expressed as a cohort effect when social change differentiates the life patterns of successive cohorts such as the older and younger "children of the Great Depression" who were born in the 1920s. Consistent with the life-stage principle, younger children, and especially the boys, were most adversely influenced by the economic stresses of the economic collapse (Elder, 1974/1999). Cohort differences were also expressed in the prevalence of a behavior or practice such as life-course reorganization or the proportion exposed to trauma in World War II.

A cohort effect may also be expressed in a changing social mechanism, as expressed in the transition to parenthood across four birth cohorts of White women in upstate New York, United States (Forest, Moen, & Dempster-McClain, 1995): 1907 to 1918, 1919 to 1923, 1924 to 1928, and 1929 to 1933. The first cohort came of age during the Great Depression, the second moved into adulthood during World War II, the third made the transition in the early post-World War II years, and the fourth became parents during the 1950s. The study found employment before marriage to be a primary source of childbearing delay for women in the first two cohorts. However, in the younger cohorts, educational advancement played a significant role in the delay of the first birth, far more than premarital employment. Advanced education was becoming increasingly important in the lives of women, including women's return to school following marriage and

the birth of children, especially in the third and fourth cohorts.

In addition to cohort effects, history takes the form of a period effect when the influence of a historical change is relatively uniform across successive birth cohorts. Rodgers and Thornton (1985) conclude that "most of the changes in marriage rates observed during this century are the consequences of period characteristics" (p. 21) rather than of differences between cohorts. They draw the same conclusion about rates of marital dissolution and instability: "the big picture is one of overwhelming historical effects that influenced all subgroups of the population substantially and surprisingly equally" (p. 29). On divorce, they refer especially to the rising level up to the 1930s, the decline in the Great Depression era, a rapid recovery to the extraordinary peak of divorce in the mid-1940s, and to the upward trend during the 1960s and 1970s. The precise factors in these period variations remain to be determined.

Efforts to disentangle these effects (cohorts and period) and those associated with maturation or aging have not advanced knowledge on historical change in lives. Cohort studies seldom address questions that specify a type of social change or the process that makes a difference. Life-span studies, for example, may assign environmental change to an error term or view cohorts as a test of the generational boundaries of behavioral outcomes, as in cohort sequential designs (Baltes, Cornelius, & Nesselroade, 1979). However, even when history is substantively important for understanding developmental change, this influence is likely to be operationalized as a period or cohort effect that provides no clue as to the precise nature of the process.

Another approach to historical change—the comparison of cohort subgroups—rests on the empirically documented assumption that members of each birth cohort are exposed differentially to trends and events. Not all children who lived through the Great Depression were exposed to severe hardships, and not all veterans of World War II were exposed to heavy combat. In the Great Depression, families did not uniformly experience the economic decline, and family hardship did not affect all subgroups of children in the same way (Elder, 1974/1999). Though variations by subgroups in specific birth cohorts represent a significant advance over cohort comparisons, even more valuable is a focus on exposure to a particular contextual or historical change. This strategy has more to offer in developmental and life-course implications because research is directed to the explication of a specific change process such as family adaptations to migration.

Cohort membership has specific implications for lives when a particular cohort size is paired with available economic opportunities. Richard Easterlin (1980) has pursued this issue in his account of postwar change in the work lives of men. His point of departure was the link between the supply of younger men and their relative economic position, and between changing cohort size relative to options and life chances. Other things being equal, the greater the relative supply of young male workers, the weaker their relative economic status and gains. Before 1960, the relatively small birth cohorts of younger men experienced a wide range of advancement opportunities, and their relative economic position (compared with older men) increased significantly. After 1960, the "baby boom" cohorts began entering the young adult category, producing a labor surplus and restricting economic progress.

The behavior of these birth cohorts was symptomatic of the "relative economic squeeze" they encountered. The economic position of young men has deteriorated relative to that of older men, family formation has been delayed by increasing numbers of young adults, and the employment rate of young women has increased more rapidly than that of older women. Among young adult cohorts during this period, an upward trend in the divorce, suicide, and crime rates is observed, as well as a leveling off in the college enrollment rate, which has climbed steadily since the 1940s. Research inspired by Easterlin has led to mixed results, however, suggesting that the model may be over-simplified (Pampel & Peters, 1995).

In part, this simplification reflects a problem shared by cohort studies as a whole: when theory and research focus on the cohort level, the linking mechanisms between lives and changing times are difficult to pin down. Cohorts can be merely "black boxes" with no information on causal dynamics and linkages. Behavioral differences between cohorts also do not readily yield an understanding of the social or historical factors that account for them. Speculation frequently takes the place of disciplined explication. The problem with cohort studies has much to do with exposure of people in a birth cohort to varied environmental changes. Thus, some grade school children are exposed to the economic stress of a

plant closing, and other children are insulated from such stresses. In response to this social heterogeneity, more studies are investigating specific types of differential social change in birth cohorts.

Before surveying one of these studies conducted by Reuben Hill, we sum up the temporality of age by identifying meanings that have special relevance to human development: the ages of life or lifetime, the diverse meanings of social time, and historical time. *Life time* is indexed by chronological age and refers to the stage or position in the developmental-aging process. From a developmental standpoint, age alerts the investigator to subgroups that are differentially vulnerable to particular types of social change. The lifetime meaning of age requires specification of the variables it represents. *Social time,* such as the age patterned sequence of events, includes "family time" across stages of parenting and the generations. A normative concept of family time indicates an appropriate time for leaving home, for marriage, and for bearing children. Last, *historical time* refers to a person's location in history; membership in a birth cohort indicates this location.

Life Cycle and Life Course

In any period of theoretical transition, both old and new models guide research. We see this mix of old and new in the 1960s. Hill's (1970) three-generation study is a case in point. The grandparent generation married before 1915 and the parent generation between the 1920s and mid-1930s. Hill made significant contributions to the life-cycle model in essays on the family cycle and development, and he launched this multigenerational study to pursue issues of intergenerational continuity and change. However, the dramatic social changes at the time underscored the historical imprecision of generational membership by placing the older and younger members of each generation in different historical epochs. Couples from the parent generation who married in the 1920s had significantly more children than those who married in the depressed 1930s. The two groups were found to be sufficiently different in life course to constitute samples of different populations.

The heterogeneity of generations on historical experience has led some analysts to identify cohorts in each one, and Hill used this modification in his own work. He investigated strategies of family management, which included the timing of marriage and parenthood, the spacing of children, the husband's and wife's entry and reentry into the labor force, and the timing of material acquisitions. Consistent with a life-course model, he noted that in periods of rapid change, "each generational cohort encounters at marriage a unique set of historical constraints and incentives which influence the timing of its crucial life decisions, making for marked generational dissimilarities in life cycle career" (1970, p. 322). The middle generation in Hill's study followed this pattern of cohort differentiation.

In one sense, the generational dimension of life-cycle analysis has helped to contextualize the individual life course by emphasizing the social dynamic of "linked lives"—parents and children, husband and wife, grandparents and grandchildren, siblings and friends. Parents and grandparents are not merely present at a stage in life, but rather appear as lifelong associates. From this vantage point, the life-cycle model made adult development especially relevant to an understanding of child development, an important insight that has not been fully realized in studies of children. Personal or social change in parents has developmental consequences for children; conversely, change in the behavior of children can alter the behavior and psychology of parents (Crouter & Booth, 2003). In concept, children become active agents of their own life course.

This life-cycle contribution to the life-course project appears in a longitudinal study of Californians from the Oakland Growth sample that were born in the early 1920s, passed through adolescence in the depressed 1930s, and were subject to the labor needs of World War II (Elder, 1974/1999). The central question concerned the effects of the Great Depression on the lives and development of the Oakland children. An intergenerational framework seemed entirely appropriate for addressing this question, with an emphasis on the process by which economic hardship made a difference in the lives of children by changing family processes and socialization.

But the dramatic changes of life experience from the 1920s into the late 1930s raised questions that could not be addressed by the perspective. The effect of change depended on many things including their exposure to the event, their age or developmental stage, and the age of their parents. Fast-changing economic and family circumstances called for relating them to the ages of parents and children. These observations made the distinctions of birth cohort and life stage especially relevant:

> At the time of maximum hardship in the early 30s, the Oakland children were well beyond the dependency state of early childhood, with its consequences for intellectual and emotional development, and they reached the age of majority after opportunities had improved through nationwide mobilization for war. Persons born 10 years before the Oakland children would have entered the labor force during the worst phase of the economic collapse, while the welfare of persons in the 1929 cohort would have been entirely dependent on conditions in their families. (Elder, 1974/1999, p. 16)

Family adaptations to economic hardship became a set of linkages between the economic collapse of the 1930s and the developmental experience of children. In place of static concepts of family life, the study turned to notions of the family economy and its multiple actors as a way of thinking about the economic crisis and its implications for children. Through linked relationships and actors, changing economic roles and status shaped the experience of children. Thus, children who acquired paid jobs in the community became more socially independent than other youth.

An appraisal of growing up in the Great Depression required knowledge of life paths to adulthood, such as education, marriage, work-life advancement, and military service. Some youth escaped hardship through early work and military service, others through higher education and marriage. However, some outcomes have more to do with their timing than with mere occurrence: Marriage is an example. Hardship favored early marriage by diminishing the chances of higher education and by making home life unappealing. Likewise, developmental theory suggested that the early work experience of adolescents would accelerate their thinking about work and the timing of their entry into adult work roles.

These and other conceptual issues made theoretical distinctions concerning the age-graded life course especially useful to the study. Consider the sequence of events that link early adolescent work experience and adult work. Family hardship increased the involvement of boys in gainful employment and, through this experience, advanced their social independence and sensitivity to matters of vocation. This sensitivity took the form of an early vocational focus and work commitment that led to work lives, which effectively countered any educational handicap of family hardship, even among the sons of working class parents. In the end, family income losses did not adversely affect the occupational standing of the Oakland men or the status that the Oakland women achieved through marriage.

As noted in this account, *Children of the Great Depression* (Elder, 1974/1999) began with concepts of the life cycle and relationship tradition, such as role sequences and generation, but soon turned to the analytic meanings of age for linking family and individual experience to historical change (especially birth cohort and life stage), and for identifying trajectories across the life course, using a concept of age-graded events and social roles. Both theoretical strands provide essential features of life-course theory on matters of time, context, and process. The life course is age-graded through institutions and social structures and embedded in relationships that constrain and support behavior. In addition, people are located in historical settings through birth cohorts and they are linked across the generations by kinship and friendship. The 25th anniversary edition of *Children of the Great Depression* (Elder, 1974/1999) includes another chapter, which compares the Oakland cohort in life patterns to that of a younger birth cohort, the Berkeley Guidance study members, born in 1928 to 1929. The Berkeley males were more adversely affected by Depression hard times than all other gender/cohort subgroups in the comparison.

Contemporary theory on the life course and its social dimensions thus differs from perspectives of an earlier era by joining the life cycle processes of social relationships with the temporality and contextual aspects of age. For examples of this shift, we need only compare Thomas and Znaniecki's *The Polish Peasant in Europe and America* (1918–1920) with its analysis of generations and lineages in a relatively timeless, abstract realm, to the birth cohort, age-graded life course, and intergenerational themes of *Family Time and Industrial Time* (Hareven, 1982)—a study of successive worker cohorts and their families in a large textile mill with declining economic prospects during the 1920s and 1930s. Though explicitly historical, *The Polish Peasant* does not locate the immigrants according to birth year and historical setting, nor does it describe their life stage at the time of their emigration. Hareven's study provides these markers and uses them to assess the implications of industrial change for worker families (parents and children) in the textile city of Manchester, New Hampshire.

Through the integration of social relationship concepts and age-based distinctions, along with life-span concepts of the person and human organism (see Figure 12.1), the life course became a vital, expanding field of inquiry in the 1970s and 1980s. Both the individual life course and a person's developmental trajectory are inter-

connected with the lives and development of others. Life-course theory thus took issue with life-span studies that viewed human development as an unfolding process, which was not coactive with social and cultural processes in historical time. However, it is responsive to Lerner's (1991, p. 27) call for more attention to contextual variability, and continues to be an emerging perspective on developmental science (Cairns, Elder, & Costello, 1996; see also Ford & Lerner, 1992; Thelen & Smith, Chapter 6, this *Handbook,* this volume) that extends across system levels and disciplines.

The contextual perspective of the life-course framework has much in common with Urie Bronfenbrenner's ecology of human development, now called bio-ecological theory (Bronfenbrenner & Ceci, 1994), but it differs in emphasis on the temporal dimension of historical, family, and life contexts. Bronfenbrenner's *Ecology of Human Development* (1979) proposed a multilevel view of the sociocultural environment, from macro to micro, but it did not include a temporal perspective on individual development across changing environments. In life-course studies, this perspective includes age-graded social trajectories or pathways as well as historical contexts. Some years later, after making a case for the person-process-context model, Bronfenbrenner (1989, p. 201) noted a major lacuna in his work that also applied to Lewin's original thinking—the dimension of time. To correct this limitation, he proposed the general concept of "chronosystem," with its three interacting components over time: (1) the developing person, (2) the changing environment, and (3) their proximal processes. Although this concept has not been widely adopted, the ecological perspective itself has generated many contextual studies of child development (Moen, Elder, & Lüscher, 1995; see also Bronfenbrenner & Morris, Chapter 14, this *Handbook,* this volume).

Human development in life-course theory represents a process of organism-environment transactions over time in which the organism plays an active role in shaping its own development. The developing person is viewed as a dynamic whole, not as separate strands, facets, or domains such as emotion, cognition, and motivation. The course of development is embedded in a dynamic system of social interchanges and interdependencies across and within levels. As noted by Bronfenbrenner (1996), this dynamic in life-course theory is illustrated well by the interlocking lives and developmental trajectories of family members who are influenced differentially by their changing world.

We turn now to some basic concepts and perspectives that center on the individual life course and developmental processes.

BASIC CONCEPTS AND PERSPECTIVES OF THE INDIVIDUAL LIFE COURSE

The individual life course and its relation to developmental trajectories represent a common meeting ground for life-course theory and developmental science, with its "perspective on individual functioning that emphasizes the dynamic interplay among processes that operate across time frames, levels of analysis, and contexts" (Cairns et al., 1996). Building on advances since the 1960s, life-course theory has uniquely forged a conceptual bridge between developmental processes, the life course, and ongoing changes in society based on the premise that age places people in the social structure and in particular birth cohorts.

To understand this conceptual bridge, we turn to elementary concepts. First, we begin with multiple levels of the life course, ranging from institutionalized pathways to cumulative patterns of context that shape the individual life course. Second, other important temporal concepts, such as trajectory, transition, and turning point, are taken up with particular emphasis on the properties of social transitions. Third, we focus on linking mechanisms that have proven highly useful in the study of contextual influences. Beginning with studies of children who were born before the Great Depression, research has revealed a set of mechanisms that link context and the individual life course. These mechanisms help to flesh out the conceptual meaning of more general principles of the life course.

The central role of agency in the shaping of lives was evident in these early studies, and subsequent research has highlighted its connections to social context. While the concept of agency encompasses many phenomena—particularly when viewed through psychological constructs such as motivations, values and aspirations, and personality—its full significance in life-course theory is found in its dynamic interplay with social location (Hitlin & Elder, in press). Finally, we consider issues surrounding selection, which refers to the factors that lead people to contexts and experiences (Caspi, 2004). Every empirical study of lives enters an ongoing system of exchanges between person and context. Selection and related concepts acknowledge this complexity and encourage heightened sensitivity to the challenges that

surround the identification of contextual influences. Paradigmatic themes of life-course theory draw on these elementary concepts in highlighting distinctive conceptual orientations such as the relation between changing times and lives.

Social Pathways, Cumulative Processes, and the Individual Life Course

Social pathways and cumulative patterns represent dynamic views of context. Pathways typically refer to sequences of social positions in and between organizations and institutions. Institutionalized pathways generally have specified time boundaries, what Merton (1982, 1984) has called "socially expected durations." The legislated ages at maturity for voting and marriage can be viewed as marking off an accepted duration of dependency. Social pathways are generally age-graded and thus identify relatively early, on-time, and late transitions. Children who are held back in school become aware of their lagging status on the educational ladder (Alexander, Entwisle, & Dauber, 1994), and company managers talk about the relation between age and grade in prospects for promotion to senior rank (Sofer, 1970, p. 239).

In addition to their age-graded nature, pathways structure the direction that people's lives can take. Pallas (2003, p. 168–169) observes that pathways have distinct features that govern how strongly people's trajectories and behaviors are shaped including, for example, the number of options a pathway leaves open in the future, the extent of mobility that is likely to be experienced, stigma and extrinsic rewards, and the importance of personal choice. Some pathways provide future opportunities and chances for upward mobility based on personal motivation, while others effectively block promising avenues irrespective of one's efforts.

Pathways are also multilevel phenomena reflecting arrangements in place at levels of culture, the nation-state, social institutions and organizations, and locale. To varying degrees, people work out their life course in established or institutionalized pathways. At the macro end of this multilevel system, governments generally establish pathways (Leisering, 2003). At micro levels, institutional sectors (economy, education, etc.) or local communities (school systems, labor markets, and neighborhoods) guide the pathways. Each system level, from macro to micro, socially regulates, in part, the decision and action processes of the life course, producing areas of coordination or discord and contradiction (e.g., marriage, divorce, and adoption laws). At the primary level of the individual actor, some decision pressures and constraints are linked to federal regulation, some to the social regulations of an employer, and some to state and community legislation.

Mayer (1986) had the nation-state in mind when he identified important societal mechanisms, "which impose order and constraints on lives" (pp. 166–167). These include the cumulative effects of delayed transitions, institutional careers, the historical circumstances associated with particular cohorts, and state intervention. Growth of the state in social regulation counters the potentially fragmenting effects of social differentiation. At the individual level, the state "legalizes, defines and standardizes most points of entry and exit: into and out of employment, into and out of marital status, into and out of sickness and disability, into and out of education. In doing so the state turns these transitions into strongly demarcated public events and acts as gatekeeper and sorter" (p. 167). These are what Buchmann (1989, p. 28) properly calls events in "the public life course."

Multilevel accounts of the life course are well illustrated with cross-national studies of the transition to adulthood (Settersten, Furstenberg, & Rumbaut, 2005), particularly in relation to the social pathways from secondary school to work (Kerckhoff, 2003; Marshall, Heinz, Krueger, & Verma, 2001). In Great Britain, secondary school-leavers can follow a path to work that consists of technical training programs or schools that provide credentials for a particular craft. With the freedom to make a wide range of choices, students also miss opportunities and desirable job placements. Far more structure is provided working-class German youth in a secondary-level system that in theory joins industrial training and education in an apprenticeship system. In principle, placement in a skilled craft is assured for youth who complete their apprenticeships. In Japan, occupational recruitment typically occurs in schools from the secondary-level to higher education, and the hiring firm provides specific job training, not the schools or craft institutes. American adolescents encounter the least amount of articulation between schooling and workplace. Vocational training in secondary schools is not closely linked to specific industries, their recruitment, and skill needs. In many less-developed countries, youth are forced to leave school early to support their families; in turn, their lowered educational attainment results in low wages, which forces their children to leave school early as well (Shanahan, Mortimer, & Krueger, 2002). This intergenerational cycle of disadvantage il-

lustrates how pathways from school to work can reproduce across the generations.

In societies, role sequences become established or institutionalized in the culture with the passage of time. With respect to work, for example, Spilerman (1977) has used the term *career lines* to refer to pathways defined by the differentiated and aggregated work trajectories or histories of individuals. In his view, career lines are "shaped by the nature of industry structures (e.g., occupational distribution, mode of recruiting into upper status slots such as promotion from below versus hiring from outside the firm) and by the institutional demography of the labor market" (p. 552). In an expanding market, these career lines extend across company and industry boundaries. Career lines vary in their receptivity to different times of entry: The trades frequently require early entry through a training program in contrast to the less age-graded nature of public school teaching and service occupations. The selection and timing of career entry are major determinants of subsequent earnings and work trajectories.

Prior to entry into work, however, young people encounter educational pathways. Studies of the educational system in the United States reveal that these pathways begin very early in life and that their effects cumulate to produce marked differences among students and workers. Thus, drawing on data from the Beginning School Study in Baltimore, Entwisle, Alexander, and Olson (2003) have documented educational pathways that begin to take form in the first grade. In a school where 88% of the students were on subsidy, every first grade student received a failing mark in reading in the first quarter. In low-SES schools more generally, the average first grade reading score was 1.64 (below a C), in contrast to students in high-SES schools, who averaged 2.15 (above a C). They also report that, even controlling for family background and standardized test scores, Black children received lower first grade reading and math scores, and these racial differences were subsequently magnified.

While students of all races and socioeconomic groups benefited from schooling to the same degree, low-SES students' reading ability decreased during the summer vacation, while high-SES students' reading improved. Given initial differences in reading and math ability and these invidious summer trends, Entwisle et al. (2003) concluded that "the long-term persistence of early rankings means that inequities visible in the first grade translate into deficits all along the line" (p. 239). Indeed, recent studies drawing on this sample show that first grade attributes—including temperamental factors, grades, and standardized test scores—predict educational attainments at age 22 as well as similar factors measured at age 16 (Entwisle, Alexander, & Olson, 2005). Interestingly, parental influence, assessed in high school, greatly underestimates the effects that parents have on their children's attainments because much of it has already been converted into school outcomes.

Kerckhoff's (1993) study of connections between school and work in Great Britain also shows patterns of divergence. Regarding achievements, he nevertheless finds continuity in students' place in the school system over time. Thus, early placement in an elite primary school is associated with the "high road" to the university. A low-status placement is frequently associated with the opposite path for students. At each stage of schooling, differences are magnified, with the transition from junior to secondary school producing the greatest deflection. In young adulthood, at age 23, one's occupational prestige reflects a set of cumulative structural influences that originated early in the life course.

By considering pathways, we understand more completely the choices and actions that shape individual life courses and their developmental implications. According to this perspective, the individual life course is determined over time by the general and specific dictates of social pathways. For the very young child, these pathways often begin, in large measure, with the residential and socioeconomic histories of parents. Small differences cumulate over time and, by young adulthood, result in significant differences in achievements and prospects. As with educational pathways, research is beginning to show how career lines form at a young age and lead to diverging patterns. For example, sociologists have typically viewed the first job for pay after school completion as the onset of one's work career, but studies are now identifying how earlier work experiences, starting at least in high school, bear on future achievements and attainments (Mortimer, 2003).

Ideally, studies of the developmental consequences of life-course change take into account the potential constraints and options associated with particular pathways. However, the realities of research are expressed in a disciplinary division of labor. Sociologists (Mayer, 2004) and historians make use of a multilevel view of the life course in their historical and comparative studies. Both attend to issues of contextual variation. As historian E. P. Thompson once said, "the discipline of history is above all a discipline of context" (Goldthorpe, 1991, p. 212). Developmentalists in psychology may

center on the impact of life-course change (Noack, Hofer, & Youniss, 1995) or simply ignore it altogether, usually the latter. At least up to the 1990s, the typical longitudinal study of social development among children, as published in Child Development, measured the socioeconomic environment only at the beginning of the research (Elder & Pellerin, 1995). Articles still recommend the use of atemporal indicators that provide a snapshot of families and children at a point in time, despite growing evidence that the dynamic features of families often are of consequence for children's well-being and achievements (Shanahan et al., 2000).

Social pathways encompass cumulative processes, which refer to long-term patterns of experiences that sustain behavioral continuity or lead to change. Some cumulative processes reflect social experiences of long duration. The concept of *duration* refers to the span of time between changes in state. The full implications of long and short exposures to a situation depend on the nature of the situation itself. For example, is divorce preceded by a lengthy period of family conflict? Little is known about the qualitative nature of experiences of long and short durations, though a lengthy involvement tends to increase behavioral continuity through acquired obligations, investments, and habits (Becker, 1964). The longer the duration of marriage, for example, the greater the chances for marital permanence (Cherlin, 1993); alternatively, marital happiness is likely to decline at all marital durations, with accelerated declines occurring during the earliest and latest years of marriage (VanLaningham, Johnson, & Amato, 2001). The connection between marital permanence and the length of marriage has much to do with shared material assets (Booth, Johnson, White, & Edwards., 1986), which often prevent divorce in spite of marital unhappiness (White & Booth, 1991). Much more needs to be known about the quality of marriages of differing durations and their development implications (Hetherington, 1999).

Duration of unemployment also increases the risk of permanent unemployment. The latter may involve acquired ties to the unemployed as well as a de-skilling process in developing the incapacity to work. Indeed, many forms of social class and economic hardship endure. In two British birth cohorts, Schoon and her colleagues (2002) found "a stark chaining or continuity of risk factors" such that parental social class powerfully predicts material deprivations through childhood, adolescence, and into young adulthood. Yet, great diversity in socioeconomic experiences has been observed through the life course, producing complex patterns of durations. To adequately understand the covariations between diverse spells and development, we need to know more about duration in interpersonal and developmental processes.

A particularly telling example of the complexity of durations and their potential meaning is found in Mortimer's (2003) St. Paul longitudinal study of adolescent employment. With monthly educational and employment data, Mortimer and her colleagues developed a typology of work patterns through high school based on duration (whether the student worked more than 18 months through the 48 months of high school) and intensity (during periods of employment, whether the student worked, on average, more than 20 hours per week). Mortimer, Staff, and Oesterle (2003) showed that ninth graders with higher educational promise—as indicated by grades and aspirations—opted for less intensive work. Low intensity workers were also more likely to save their earnings for college. In turn, "steady workers" (high duration, low intensity) are more likely to earn a BA degree within 9 years of high school graduation than high duration-high intensity workers. Indeed, among students with low levels of educational promise, those who chose a steady work pattern were more likely to receive their BA than their low promise, high duration-high intensity counterparts. Such findings suggest that work of differing durations and intensity has distinct meanings and consequences and highlight the misleading nature of cross-sectional studies.

The duration of children's exposure to poverty is likewise complex. Although poverty durations in the early life course have been linked to numerous indicators of psychosocial adjustment and achievement—including cognitive development (G. J. Duncan, Brooks-Gunn, & Klebanov, 1994), delinquency (Jarjoura, Triplett, & Brinker, 2002), and, perhaps to a lesser extent, emotional outcomes (Brooks-Gunn & Duncan, 1997)—little is known about the mechanisms that account for such relationships. The challenge of understanding how the duration of poverty coincides with developmental experiences is complicated by the patterns of deprivation observed in national samples.

Between ages 1 and 17, about one-third of American children will spend at least 1 year in poverty (Rank & Hirschl, 1999). Of individuals experiencing poverty, about half of Blacks and one-third of Whites will fall into poverty in 5 or more of the next 10 years (Stevens, 1999). Bane and Ellwood (1986) conclude that "the average poor black child today appears to be in the midst of a poverty spell which will last almost 2 decades"

(p. 21). However, most poverty spells turned out to be comparatively shorter, owing in large measure to markedly improved earnings (Bane & Ellwood, 1986). Slightly more than 40% of poverty spells in the Bane and Ellwood analysis ended within a single year. About 70% were over within a period of 3 years. In addition to the potentially complex patterns of poverty over the life course, the first transition into poverty—particularly if unexpected—may be especially damaging to children's well-being (Oh, 2001).

Besides the duration of poverty, time spent in various social classes may also be important to well-being and achievement but, once again, temporal patterns of social class may be complex. McDonough, Duncan, Williams, and House (1997) showed that low income (i.e., less than $20,000 per household) that persisted 4 to 5 years raised the risk of mortality among adults significantly when compared to households experiencing this income level for a transitory period. Middle-income adults, however, are at increased risk for mortality if their income fluctuates appreciably over a 5-year period. Drawing on the British Birth Cohort of 1958, Power, Manor, and Matthews (1999) show that lifetime patterns of social class (based on father's occupational status at birth, and then one's own occupational status) predict poor health at age 33. The risk of poor health increased for men in the most advantaged (4%) to the least advantaged (19%) lifetime SES groups (see also Mare, 1990).

The duration effects for socioeconomic stressors may be nonlinear, in which case a tipping point is reached before an adverse outcome is observed. Additional time spent in deprivation may lead to a nonlinear increase in distress. For example, Wadsworth, Montgomery, and Bartley (1999) observed that British men who experienced a long period of unemployment (exceeding 3 consecutive years) reported less healthy profiles subsequently, although this effect was not observed for lesser durations.

Durations of poverty, low income, and other forms of socioeconomic disadvantage are likely to be related to a wide range of indicators of adjustment and achievement, although very little is known about the linking mechanisms. One plausible mechanism is exposure to stressors and the availability of supports and coping mechanisms. While material resources undoubtedly shape the stress process (Link & Phelan, 1995), a detailed understanding of how temporal patterns of social class link to stressors, supports, and coping mechanisms remains largely unaddressed. The quality of one's paid work is another plausible candidate linking social class with long-term outcomes.

Characteristics of paid work are known to be associated with psychological and physical functioning, although little research has investigated temporal patterns of work characteristics. A notable exception is Amick and his colleagues (2002), who report that men who spend their work lives in jobs with low levels of control have a 43% increase in chance of death when compared with men who have jobs with high levels of control over their work life. Thus, multiple aspects of social class are likely to matter for well-being, but such relationships depend on the duration of experiences.

Many cumulative processes refer not to the duration of a particular social circumstance but rather to the triggering of chains of interrelated events, which have significant implications for later well-being and attainment (Rutter, 1989). Behavioral continuities across the life course are likely to be found in social interactions that are sustained by their consequences (*cumulative*) and by the tendency of these styles to evoke maintaining responses from the environment (*reciprocal*; Caspi, Bem, & Elder, 1989). In *cumulative continuity,* both individual dispositions and family values are likely to favor the choice of compatible environments, and this reinforces and sustains the match. Thus, antisocial youth tend to affiliate with other problem youth, and their interaction generally accentuates their behavior, producing over time what might be described as *cumulative disadvantages* (Cairns & Cairns, 1994; Sampson & Laub, 1997; Simmons, Burgeson, Carlton-Ford, & Blyth, 1987). Among problem youth from inner-city neighborhoods, those who were most negative toward their life chances lacked the support of close kin and friends, did not have a supportive older sibling, and were most likely to be involved with deviant friends (Furstenberg, Cook, Eccles, Elder, & Sameroff, 1999).

Reciprocal continuity refers to a continuous interchange between person and environment in which reaction forms action and then by another cycle of action and reaction. As with cumulative continuity, the net result of reciprocal continuity is the cumulation of experiences that tend to maintain and promote the same behavioral outcome. Baldwin (1895) refers to such interchanges as "circular functions" in ontogeny. The ill-tempered outburst of an adolescent may provoke a cycle of parental rage and aggression, a widening gulf of irritation, and, finally, parental withdrawal, which reinforces the adolescent's initial aggression (Pepler & Rubin, 1991). Over time, the interactional experiences of aggressive children can establish attitudes that lead them to project interpretations on new social encounters and

relationships, thereby ensuring behavior that affirms the expected behavior. Aggressive children generally expect others to be hostile and thus behave in ways that elicit hostility, confirming their initial suspicions and reinforcing their behavior.

A growing body of evidence points to cumulative processes linking early social experiences—particularly forms of inequality—and later health and well-being (Power & Hertzman, 1997). Drawing on the Dunedin sample, for example, Poulton and his colleagues (2002) show that childhood socioeconomic status (based on occupational categories) is an important predictor of physical health at age 26 even with adult socioeconomic position controlled. Children growing up in households marked by low socioeconomic conditions have poorer health—defined, for example, by the body-mass index and cardio-respiratory fitness—when compared with children who grow up in high socioeconomic households, regardless of their adult socioeconomic status. The cumulative mechanisms that link such early experiences with later physical well-being are not well documented, although plausible mechanisms include health-related behaviors (van de Mheen, Stronks, Looman, & Mackenbach, 1998).

Can cumulating processes that lead to poor outcomes be neutralized by subsequent experiences? The possibility is not often entertained, and the answer is likely to depend on the processes being studied, their temporal properties, and indicators of well-being and achievement at issue. However, the question reflects the interest in dynamic views of context and contingency that life-course analysis promotes. Research shows, for example, that marital transitions involving the loss of a partner are associated with declines in adult health. Can subsequent remarriage improve matters? It likely does (Willitts, Benzeval, & Stansfeld, 2004), but its salutary effects appear to diminish with the number of prior marital transitions (Barrett, 2000).

Similarly, unemployment is thought to diminish adult health and subsequently the family support of children. In what circumstances will reentry into the labor market lead to improvements in well-being? Drawing on a representative sample of English and Welsh working men, Bartley and Plewis (2002) examined the effects of occupational category and unemployment status in 1971, 1981, and 1991—covering most of the men's working lives—on long-term illness. Unemployment in 1971 and 1981 and occupational class at all three time points had independent effects on illness, providing powerful evidence for cumulative effects. By implication, recent employment compensates, at least in part, for prior spells of unemployment, as does improvements in one's occupational status (see Poulton et al., 2002).

Experiences may cumulate because social circumstances are largely stable or lead to "functionally equivalent" relationships with people and involvements with organizations and institutions. In the latter case, chains of interrelated experiences all encourage the same behavioral outcomes.

Trajectories, Transitions, and Turning Points

Social pathways and cumulations of experience present temporally sensitive descriptions of context. Trajectories provide a dynamic view of behavior and achievements, typically over a substantial part of the life span. Transitions refer to a change in state or states such as when youth leave home. A substantial change in the course of a behavioral trajectory, often during transitions, may represent a turning point.

Trajectories and transitions are elements of established pathways, their individual life courses, and developmental patterns. Among individuals, social roles evolve over an extended span of time, as in trajectories of work or family; and they change over a short time span. The latter may be marked by specific events such as children entering school for the first time, completing the first grade successfully, and graduating from high school. Each transition, combining a role exit and entry, is embedded in a trajectory that gives it specific form and meaning. Thus, work transitions are core elements of a work-life trajectory, and births are important markers along a parental trajectory.

Trajectories and transitions refer to processes that are familiar in the study of work careers and life events. The language of careers has a distinguished history in the field of occupations and the professions, and it still represents one of the rare languages that depict a temporal dimension or process. Career lines, as pathways, refer to sequences of positions, while careers, as trajectories, refer to coinciding behaviors and achievements. Work careers have been defined as disorderly and orderly, and achievements have been represented as career advancement, whether early or late, rapid or slow (Wilensky, 1960). The term *career* has also been applied to the trajectories of marriage and parenthood (Hill, 1970). All of these uses fall in the more inclusive definition of a life-

course trajectory. The term does not prejudge the direction, degree, or rate of change in its course.

A developmental trajectory refers to change and constancy in the same behavior or disposition over time, but consistency of measurement may be difficult to achieve in many cases, especially in the measurement of aggression and dependency (Kagan & Moss, 1962). Nevertheless, trajectories of intraindividual change tell a different story from life stories based on cross-section analysis, and this concept is compatible with widely shared views of development (Molenaar, Huizenga, & Nesselroade, in press; Tremblay, 2004). Further, the modeling of trajectories has become increasingly sophisticated, offering the analyst increasing options for thinking about patterns of change (e.g., Collins & Sayer, 2001; T. E. Duncan, Duncan, S. Strycker, Li, & Anthony, 1999; Singer & Willett, 2003).

Developmental trajectories are also integral to life-course theory, especially when they are studied as interdependent with the changing dynamics of social trajectories. In a four-wave study of early adolescents, based on growth-curve models, Ge and his colleagues (Ge, Lorenz, Conger, Elder, & Simons, 1994) found that (a) the trajectories of depressive symptoms increased sharply among White girls, surpassing the symptom level of boys at age 13; (b) the increase for girls was linked to their exposure to an increasing level of negative events; and (c) the initial warmth and supportiveness of a mother minimized the subsequent risk of depressed states and negative events among daughters. Studies such as these have inspired many efforts to interrelate developmental trajectories and context, although frequently neglecting the changing nature of social circumstance.

Increasing attention is being devoted to the study of classes of behavioral trajectories based on the supposition that people may be qualitatively distinct in their developmental patterns (Bauer & Curran, 2004; Nagin, 1999; Nagin & Tremblay, 2001). According to this perspective, the population is heterogeneous with respect to behavioral trajectories; as such, distinct subgroups can be identified, and their covariates examined. For example, Moffitt (1993; see also Moffitt, Caspi, Harrington, & Milne, 2002) hypothesized that aggregate patterns in antisocial behavior conceal two distinct groups: (1) A small percentage of youth engaged in antisocial behavior at every stage of life ("life-course persistent"), and (2) a larger percentage of youth engaged in antisocial behavior during adolescence only ("adolescence-limited"). Indeed, drawing on semiparametric models, researchers have uncovered evidence for unique trajectories of antisocial behavior (e.g., Nagin & Land, 1993). With greater use of such models there has been increasing appreciation for methodological issues (see Bauer & Curran, 2003 and accompanying exchanges; Eggleston, Laub, & Sampson, 2004; Nagin, 2004) and theoretical nuance (Nagin & Paternoster, 2000) that complicate the search for qualitatively distinct types of behavioral trajectories. Nevertheless, this approach raises exciting possibilities for linking behavioral patterns with change and stability in context and experience.

The multiple role trajectories of life patterns describe *strategies of coordination* or *synchronization.* Various demands compete for the individual's or family's scarce resources such as time, energy, and money. Goode (1960) argues that an individual's set of relationships is both "unique and overdemanding," requiring strategies that minimize demands by scheduling and rescheduling transitions where possible. To cope with simultaneous, linked trajectories, the scheduling of events and obligations becomes a basic task in managing resources and pressures. The needs of children and financial requirements, for example, play important roles in determining work and leisure options.

The meaning of a transition has much to do with its *timing* in a trajectory. Consider the case of parenthood: the earlier the event, the greater the risk of social and health disadvantages for mother and child (Furstenberg, Brooks-Gunn, & Morgan, 1987). Early life transitions can have developmental consequences by affecting subsequent transitions, even after many years and decades have passed. They do so through behavioral consequences that set in motion cumulative advantages and disadvantages, with radiating implications for other life domains. A Baltimore study of adolescent mothers who were followed from 1966 to 1984 (Furstenberg et al., 1987), shows that variations in personal resources (e.g., IQ) during adolescence affected their economic success by influencing how they timed and ordered early events from marriage to education or employment. From the vantage point of this study, the quality of transition experiences early in life may foretell the likelihood of successful and unsuccessful adaptation to later transitions across the life course.

Transitions to parenthood during adolescence in the Baltimore panel raise another important general distinction: Life transitions can be thought of as *a succession of mini-transitions or choice points.* The transition from marriage to divorce is not simply a change in state, but

begins with disenchantment and extends across divorce threats, periods of separation, and the filing of divorce papers. Different causal factors may operate at each phase of the process. The "origin" influences that increase the risk of disenchantment are likely to differ from those that sustain the process toward marital dissolution. In like manner, we can think of the transition to motherhood in adolescence as a *multiphasic process* in which each phase is marked by a choice point with options and social constraints.

For example, young women may choose to engage in premarital sex or not, to use contraception or not, to seek an abortion or not, and to marry the father or not. Only a handful of options lead to an illegitimate birth. After the birth of a child, young women face other decisions, such as whether to ask for their mothers' help in child care or to put the child up for adoption, to marry or to remain single, or to pursue educational and employment possibilities or to enter the welfare system. The implications of having an illegitimate birth vary according to the options chosen. Some opportunities blend well in favoring positive outcomes: They represent an adaptive strategy, while others do not.

Figure 12.2 presents a series of transitions that can lead to unwed motherhood, as sketched from the Baltimore study. Each choice point occurs at a different state in a young girl's life and thus could involve varied life-course dynamics and explanations. The process of becoming an adolescent mother requires sexual activity, failure to use, or ineffective use of, contraception, and, once pregnant, the decision to bear and raise the child. Across these stages of the process, an agency "has several possible points at which to target its interventions; at initiation of sexual activity, at contraception use, or, at the resolution of a pregnancy" (Hofferth, 1987, p. 78).

The significance of this formulation becomes apparent when we return to a time when unwed motherhood was viewed simply as one transition, a concept that obscured the strategic points of preventive intervention along the life course. Given their multiphasic nature, many transitions cover relatively long periods. The female pubertal transition, for example, begins before menarche and may last well beyond it. As Dorn and her colleagues (Dorn, Susman, & Ponirakis, 2003) observe, "Although menarche itself is an event (the first bleed), the integration of our findings of pre- and postmenarcheal hormone variability support a conceptualization of menarche as an integral part of a longer-term biological process" (p. 300). Similarly, the transition to adulthood—as indicated by demographic markers—begins when youth complete school, which occurs at age 17 or 18 for most American youth, and ends with family formation, which may take place in the mid-30s, if at all (Fussell & Furstenberg, 2005). Developmentalists tend to view transitions as dis-

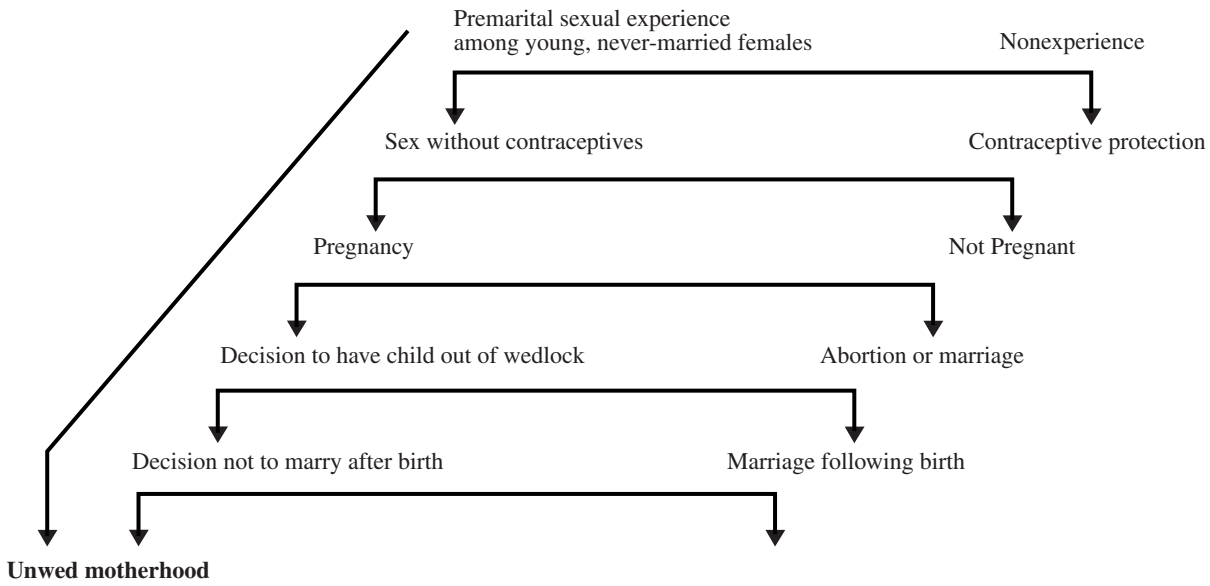


Figure 12.2 The life course of unwed motherhood. As adapted from "Family Transitions, Cycles, and Social Change" (p. 41), by G. H. Elder Jr., in *Family Transitions,* P. A. Cowan and M. Hetherington (Eds.), 1991, Hillsdale, NJ: Erlbaum. Reprinted with permission.

crete events that occur in a relatively short period and, consequently, very little is known about the sequence of minitransitions leading to full transitions.

The two faces of a transition—leaving a state and entering a new state—can have different causal explanations, as when divorce is followed by remarriage. Moreover, "leaving a state" is part of the individual's history that shapes the meaning of the new role or situation (Wheaton, 1990). Leaving a conflicted, violent marriage would cast single status as a stress-relieving status. The meaning and developmental implications of a transition depend on the timing of the change relative to norms and cognitive expectations. Judging from studies conducted to date (McLanahan & Sorensen, 1985; Wortman & Silver, 1990), widowhood is most distressing for young women, a time when the event is least expected or normative. By comparison, job loss during young adulthood is relatively common, and entails less of an emotional risk than in the later years.

The apparent contrast between institutionalized transitions and personal, idiosyncratic "transition experience" can misrepresent reality. In many cases, life transitions are an institutionalized status passage in the life course of birth cohorts and a personalized transition for individuals with a distinctive life and social history. The latter may represent an individual working out of the former. These faces of a transition apply to the normative transitions of life, from birth to school entry, marriage, parenthood, and retirement. Transitions of this kind may seem more predictable and structured than nonnormative events, but all transitions can be sorted according to their structuredness or degree of external regulation, duration, timing, predictability, and novelty.

Life transitions into different environments facilitate this process by representing potential *turning points* in a trajectory for a troubled life course. Such turning points are sometimes referred to as "knifing off" past experiences, which can allow for new opportunities and behavioral patterns. One example of a turning point is the desistance from criminal activity, a "knifing off experience" that involves a transition into new situations that provide monitoring, social supports, growth experiences, and the emergence of a new self-identity (Laub & Sampson, 2003). Military service, gainful employment, and marriage are all new role commitments that provide opportunities for a break from the past and social integration (see also Bouffard & Laub, 2004).

A further example of turning points—this time in an educational trajectory—is found in a study of feeder patterns into high school. In the American school system, pathways between middle school and high school are structured in different ways, affecting the proportion of one's middle school classmates who attend the same high school. Schiller's (1999) study of how differing feeder patterns affect subsequent grades is revealing. Among students receiving mostly Cs in middle school, high school math grades decrease as the proportion of one's classmates in the same high school increases. The reverse is true among students receiving mostly As in middle school: High school math grades increase as the proportion of one's classmates in the same high school increases. As Schiller notes, when middle school students disperse into many high schools, opportunities seem to open up for students at the bottom, as peer networks are disrupted. Consistent with a turning point, the old social world is knifed off and new opportunities for growth and identity change present themselves.

The concept of turning point also applies to the particular way people view their life trajectory—a subjective account of lived experience involves some degree of change in situation, behavior, or meaning. Maruna and his colleagues' (2001) exceptional interview study of desistance among ex-convicts is one of a few research efforts to investigate the changing nature of the self during a turning point. Important themes in the life narratives of desisters include acknowledging past crimes, understanding their genesis, and recasting the self as in control and with newfound purpose. Clausen (1995) has used detailed analyses of life histories to assess the subjective turning points of people who have been part of a longitudinal study for 60 or more years. Based on this work, he concludes that "one's life does not have to take a different direction for a person to feel that a turning point has occurred. But one must have a feeling that new meanings have been acquired, whether or not life experiences are much changed" (p. 371).

The challenge to life-course study is to understand the linkages among changing pathways and transitions, life patterns, and developmental trajectories. A useful first step in this direction leads to mechanisms that link context and the individual life courses. Our next topic of basic concepts and distinctions.

Selection, Endogeneity, and Contextual Effects

Life-course analysis investigates the dynamic features of social contexts and seeks to understand the relevant mechanisms by which time and place shape human

development. Any study of context and behavior must address the complex processes by which people select and otherwise experience specific environments in the first place (Caspi, 2004). Consider life-events, which numerous studies identify as potent stressors. Virtually all research on life-events views them as causes of distress (e.g., depressive symptoms) with very little appreciation that (a) distress can increase the likelihood of encountering life-events, and (b) various circumstances (hypothetically, for example, working conditions, socioeconomic status) may cause both life-events and depressive symptoms. By failing to account for these exogenous processes, the estimated effect of life-events is likely to be biased. Moreover, this task involves important issues of theory as well as methods.

Thoits's (1994) study of life-events and mastery is instructive. Drawing on two measurement occasions, she classified the stress associated with major life-events in the workplace and in one's romantic life as (a) solved, (b) unsolved but attempted to solve, and (c) unsolved and did not try. Scores on a mastery scale at Time 1 were highest at Time 2 for adults who reported no problematic situations. Scores diminished significantly for adults who encountered life-events and solved them but were lowest for people who encountered life-events and did not solve them. Mastery predicted the subsequent experience of life-events and attempts to resolve their attendant distress. Similarly, Shanahan and Bauer (2005) show that low levels of mastery in high school increase the likelihood of life-events after graduation, which in turn diminish mastery in young adulthood. Indeed, growing evidence suggests that internalizing and externalizing symptoms increase the likelihood of encountering stressors (Aseltine, Gore, & Gordon, 2000; Hoffman & Cerbone, 1999; Kim, Conger, Elder, & Lorenz, 2003; Leadbeater, Kuperminc, Blatt, & Herzog, 1999). By implication, failure to account for such initial differences might well overstate the true magnitude of the effect of such stressors on personal well-being.

More generally, the challenge of preexisting differences that lead people to contexts and promote behavioral outcomes is pervasive in the study of human development. Thus, high school students tend to enter college environments that "are consistent" with their personal characteristics (Alwin, Cohen, & Newcomb, 1991), assortative processes create homophily in forming friendships and heterosexual pairs (Caspi & Herbener, 1990), and risk takers in military service are likely to end up in combat units (Gimbel & Booth, 1996). Transitions of this kind generally accentuate the behavioral effect of the selected dispositions, producing greater individual differences and heterogeneity between groups. Cairns and Cairns (1994, p. 117) observe that social selection and accentuation go together in peer group formation. Once a group is formed in terms of selected attributes (e.g., aggressivity), the selected behaviors are accentuated. This process has obvious social implications when unruly behavior is involved and makes identifying "peer effects" particularly difficult.

Much research has examined the effects of paid work during high school on grades, neglecting the possibility that less academically engaged students may choose to work longer hours. Adjusting for such a selection process, the effect of work hours on grades is negligible or insignificant (Schoenhals, Tienda, & Schneider, 1998; Warren, LePore, & Mare, 2000; see also Paternoster, Bushway, Brame, & Apel, 2003, for the case of paid work and antisocial behaviors). The issue can also be viewed in experimental terms: When preexisting differences between people cannot be ruled out by random assignment (e.g., differing levels of school engagement), the "pure effect" of the experimental manipulation (e.g., hours per week of paid work during high school) on the outcome (e.g., grades during high school) cannot be determined with certainty.

In some instances, the problem can be addressed with highly revealing randomized trials. What, for example, are the implications of residential change? Perhaps moving from poor urban areas to more advantaged neighborhoods improves the lives of children. Do they profit from the change? The question is difficult to answer given that certain types of families—those possessing more resources—would be likely to move in the first place. Yet, a randomized study of the question became possible with the Moving to Opportunity (MTO) demonstration project, which has operated in five U.S. cities (Baltimore, Boston, Chicago, Los Angeles, and New York) since 1994 (see Katz, Kling, & Liebman, 2001; Ludwig, Duncan, & Hirschfield, 2001). Families were eligible to participate if they had children and lived in public housing or Section 8 housing with a neighborhood poverty rate of 40% or more. Interested families who applied were randomly assigned to one of three groups: the experimental group (which received rent vouchers for housing in low poverty areas), a Section 8 comparison group (which received unrestricted rent vouchers), and a control group (which did not receive rent vouchers). The design is especially helpful in

learning about how neighborhoods affect well-being because, in normal circumstances, specific types of families live in specific types of neighborhoods, which makes it difficult to disentangle the contributions of families and neighborhoods.

In the typical move to a middle-class, European-American suburb, the African American mothers and their children were involved in radically different worlds with higher behavioral expectations and typically European-American age-mates. If unemployed before the move, African American mothers who moved to the suburbs were more likely to find jobs and to engage in job searches, when compared to the city movers. In the follow-up, the suburban minority students more often followed a college track and attended a 2- or 4-year college. If not in college, they were nearly twice as likely as city movers to be employed full-time with pay greater than the minimum wage and job benefits. The suburban adolescents were also far more likely to be engaged daily in activities with European-American students, despite racial threats and harassment.

Before and after comparisons show that the transition improved life chances, at least for the females. Four to 7 years after baseline, girls' mental health improved, although boys' problem behaviors may have worsened as a result of their families' receiving the MTO offer to move (G. J. Duncan, Clark-Kauffman, & Snell, in press). Girls in the experimental group also reported less risky behavior and better educational outcomes, while males exhibited more risky behaviors and physical health problems (Kling & Liebman, 2004). The lack of advantage for boys in the MTO experimental group is difficult to explain, although Kling and Liebman speculate that boys in the experimental group may have experienced stereotypes, relinquished fewer ties to their old neighborhoods, and settled into peer groups that exerted negative influences. Rabinowitz and Rosenbaum (2000) provide valuable developmental insights on these transition experiences in their account of Chicago's Gautreaux program, with its goal of enabling families to leave public housing for suburbs and city neighborhoods that were better off financially.

In many instances, randomized trials such as the MTO are not possible or offer imperfect solutions themselves (Kaufman, Kaufman, & Poole, 2003). In such cases, statistical models may be helpful in determining unbiased effects of social context. Yet, no statistical solution is without assumptions and drawbacks (e.g., Bound, Jaeger, & Baker, 1995, on instrumental variable estimation). More important, the issue can also be viewed through life-course theory. As George (2003) notes, selection and endogeniety are less a methodological nuisance than another way of describing ideas that have long been central to life-course theory, particularly pathways and agency. In a life course, contextual experiences most likely reflect prior circumstances. Such prior conditions and experiences represent a substantive interest of life-course research, although they can also be viewed as potential threats to identifying the relationship between present circumstances and behavior.

LIFE TRANSITIONS AND HISTORICAL CHANGE

We have identified properties of life transitions that specify a way of thinking about social change and its psychosocial effects. According to this account, social change refers to a broad range of transitional phenomena such as residential change. Additional contributions to this perspective come from mechanisms that link transitions and life patterns to historical change, such as the Great Depression and World War II, and to paradigmatic principles that define the life course as a theoretical orientation. These mechanisms include the notion of life stage and its social roles, the social imperatives of new roles or situations, the cycle of losing and regaining a sense of personal control in changing situations, and the accentuation of individual dispositions in changing environments. Each of these mechanisms involves interdependent lives. The paradigmatic principles draw on these mechanisms in charting the perspective of life-course study—the principles of lifelong development and aging, human agency in making choices, the importance of timing in lives, linked lives, and historical time and place (Elder, 1998b). These principles represent more general theoretical themes that collectively define the analytical scope of life-course theory.

Linking Mechanisms

Linking mechanisms refer to the processes by which social change and behavioral development are interrelated. They were originally documented in *Children of the Great Depression* (Elder, 1974/1999), a study of cohorts born at opposite ends of the 1920s and occupied different life stages when the economy collapsed. The

life-stage principle, noted above, suggests that young people of different ages are likely to be exposed to a different slice of history. Indeed, the Oakland children passed through adolescence during the worst years of the Great Depression, but the Berkeley children became teenagers in World War II. Consequently, job scarcity, financial pressures, and emotional stress represented defining features of the Oakland cohort's transition from childhood to young adulthood. By contrast, members of the Berkeley cohort were exposed to the "empty households" of World War II when parents worked from sun up to sun down in home front industries.

By encountering the Great Depression and other historical events at different times in life, the Oakland and Berkeley cohorts have different stories to tell about their childhood, adolescence, and adulthood. The particular sequence and timing of prosperity, economic depression, and war distinguishes the developmental experiences of the two birth cohorts. The concept "goodness of fit" in the match of person-environment is an important feature of the life-stage principle and its implications for human development (see Eccles & Midgley, 1989, p. 9).

Consider the Berkeley males who entered the Great Depression when they were highly dependent on family nurturance and vulnerable to family instability. Economic hardship came early in their lives and represented a prolonged deprivational experience, from the economic valley of the 1930s to the war years and departure from home. By comparison, the Oakland males were older and more independent when hardship hit their families. They assumed important roles in the household economy and entered adulthood with a more crystallized idea of their occupational goals. Despite some handicaps in education, they managed to end up at midlife with a slightly higher occupational rank. The life stage of the Oakland males represented a better fit in the match between person and environment when compared to the Berkeley males.

The vulnerability of the younger Berkeley boys is consistent with the results of other studies, which show that family stressors are especially pathogenic for males in early childhood (e.g., Rutter & Madge, 1976). How can we explain the accomplishments of the older Oakland males up to middle age? One explanation is that they assumed valuable economic and household roles amid family hardships. Family experience of this kind enhanced their social independence and reduced their exposure to family conflict. Another explanation centers on the military experience of most of these young men. Service in the military made higher education more possible through the GI Bill and frequently led to a supportive marriage.

Another linking mechanism involves *situational imperatives,* the behavioral demands or requirements of a new situation. The more demanding the situation, the more individual behavior is constrained to meet role expectations. In emergency family situations, helpful responses become an imperative for members, as in hard-pressed families during the worst years of the Great Depression. Rachman (1979) refers to these imperatives as "required helpfulness." The Oakland children were old enough in the early 1930s to be called on to meet the increased economic and labor needs of their family, and a large number managed to earn money on paid jobs and to help in the household. This money was often used to cover traditional family concerns such as school expenses.

In deprived families, girls generally specialized in household chores, while boys were more often involved in paid jobs. This gender difference made girls more dependent on the family and generally fostered greater autonomy among boys. Adolescent jobs in the 1930s typically included what might be regarded as odd jobs in the adult world, from waiting on tables and clerking to delivering newspapers and running errands. Employment of this kind may seem developmentally insignificant, though it carried the important implication that people counted on them—they mattered. Indeed, staff observers rated the working boys as more energetic and efficacious than other boys on a set of scales. The flow of influence was no doubt reciprocal. The more industrious were likely to find jobs and success in work that would reinforce their ambition. With additional chores at home, working boys experienced something like the obligations of adult status. To observers who knew them, they appeared to be more adult-oriented in values, interests, and activities when compared to other youth.

Boys who managed both household chores and paid jobs were most likely to think about the future and especially about a career. In adulthood, these youth were more apt to have achieved a measure of clarity and self-assurance in their work career when compared to other males. They also settled more quickly on a stable line of work and displayed less floundering during their 20s. Apart from level of education, this work life has much to do with the occupational success and work ethic of men who grew up in deprived families during the 1930s. The response of these young people to Depression imperatives had enduring consequences for their lives and values.

The developmental significance of adaptations to the imperatives of new and challenging situations is expressed across the life course and in other cultures.

Consider the reunification of West and East Germany, which produced dramatically new worlds, "almost from one day to the next, new laws, new institutions, and a new economic system governed the lives of the people of East Germany" (Pinquart & Silbereisen, 2004, p. 290). For the young, the school system changed almost overnight and students soon faced a dramatically different economy as well. Silbereisen launched a project to study these changes and their developmental effects soon after the collapse of East Germany—a cohort of East and West Germans from age 13 to 29 in 1991, followed up by a 1996 survey. Adaptations to the unification process were slow in coming among respondents in the study, and especially among those from former East Germany such as young women of lower status. They reported later family transitions and financial self-support in 1996, when compared to the West Germans.

Situational imperatives are elements of new situations that characterize *control cycles,* which, as described by W. I. Thomas (see Elder & Caspi, 1988), refer to changing relations between expectations and resources that affect a sense of personal control. A loss of control stems from a process in which resources fall below expectations. This change motivates efforts to restore control by adjusting expectations, resources, or both in terms of their relation. During the Great Depression, heavy income loss tended to affect children, sometimes adversely, through family adaptations to such deprivation in the Great Depression. These include the reduction of family expenditures, the employment of more family members, and the lowering of living standards (Elder, 1974/1999). Equilibrium in these financially strained families was achieved when expectations matched resources. The psychology of this cyclical process is well described by what Brehm and Brehm call "reactance" (1982). Feelings of reactance occur whenever one or more freedoms or expectations are eliminated or threatened. Such emotions spur efforts to regain or preserve control. "It is the threat to control (which one had) that motivates an attempt to deal with the environment" (p. 375). Once control is achieved, expectations may be raised, thereby setting in motion another round of equilibrating initiatives.

The final mechanism, known as the *accentuation dynamic,* relates transition experiences to the individual's life history of past events, acquired dispositions, and meanings. When a transition heightens a prominent attribute that people bring to the new role or situation, we refer to the change as an accentuation effect. Entry into new roles or situations is frequently selective, and the accentuation dynamic tends to amplify selection behaviors. From this perspective, early transitional experiences become prologues for adult transitions that increase heterogeneity over the life course. We see this development in longitudinal studies of divorce and their increasing attention to the behavioral changes initiated by it across the life course and the generations (Amato, 2000; Amato & Cheadle, 2005). In children, as well as adults, the divorce transition appears to accentuate dispositions that were present well before the event itself. For example, boys with behavior problems after a divorce were frequently engaged in problem behavior before the divorce.

Selection and social causation processes are interwoven in this accentuation process. Quinton and associates (Quinton, Pickles, Maughan, & Rutter, 1993) show this process in the history of a conduct disordered boy. Conduct disorder is associated with conflicted, dysfunctional parenting. Children in these environments were most at risk of choosing deviant friends when parents were in conflict. A harmonious family sharply reduced this risk. The next step involved the selection of a deviant partner, a process that occurred through a deviant peer network. For girls, and especially those not inclined to plan, early pregnancy resulted from a deviant boyfriend. More future-oriented youth managed to avoid this outcome and were better able to establish stable relations with nondeviant mates.

As a whole, these linking mechanisms—life stage, situational imperatives, control cycle, and the accentuation dynamic—represent different understandings of the connections among individual lives, developmental trajectories, and the changing social world. They are embedded in a theoretical framework defined by paradigmatic principles of the life course where they specify the dynamics at work. Consider, for example, the first principle on human development and aging as lifelong processes. New transitions along the life course establish different life stages and tend to accentuate the dispositions people bring to the situation with its social imperatives in shaping behavior. A life transition also entails some loss of personal control and motivates efforts to regain it.

Paradigmatic Principles of Life-Course Theory

The following principles emerged from studies of *Children of the Great Depression* (Elder, 1974/1999), subsequent research, and the complex interplay of intellectual and social forces at the time that stressed the importance of placing human development in a lifelong context (Elder, Johnson, & Crosnoe, 2003). Collectively,

they define the life course as a theoretical orientation that provides a framework for studying phenomena at the nexus of social change, social pathways, and developmental trajectories. We begin with the principle of life-span development.

The Principle of Life-Span Development: Human Development and Aging Are Lifelong Processes

Over the years, the life span has been represented as a sequence of life stages, from infancy and early childhood to old age. Each stage became an age-specific domain for specialized study. However, we recognize now that developmental and aging processes are most fully understood from a lifelong perspective (Kuh, Power, Blane, & Bartley, 1997). Behavior patterns at midlife are not only influenced by current circumstances and by the anticipation of the future, but also by prenatal and early childhood experiences. The biomarkers of predisease pathways extend back to the early years (Singer & Ryff, 2001) and, perhaps, even reflect intrauterine experiences shaped by the mother's context and experiences. Long-term studies are documenting the relationship between late-life adaptation and the formative years of life-span development. These include the national longitudinal studies of birth cohorts in Great Britain, marked by birthdates of 1946, 1958, 1970, and 2000. They are all scheduled to be followed into the later years of life (Ferri, Bynner, & Wadsworth, 2002). Such long-term longitudinal studies are still rare.

This temporal frame poses major challenges as well as exciting opportunities. The longer a life is studied, the greater the risk of exposure to social change. The lives of people in their 80s or 90s are thus most likely to reflect the particular contours of a changing society. Longitudinal data archives generally lack adequate information on change in social relationships, social organizations, and residential ecologies. However, the availability of geographic codes with coordinates that map households for users of large data sets now enable investigators to assess contextual changes and their effects on lives.

Another challenge posed by the principle of lifelong development and aging centers on the question of why some behavioral patterns persist while others fade. What influences play a role in this change? We are just beginning to identify mechanisms that drive patterns of continuity and change. For example, Caspi and Bem (1990) identify three modes of interaction between person and situation that have relevance to individual continuity and change: (1) evocative, (2) reactive, and (3) proactive interactions. Evocative interactions refer to the process by which an individual's appearance, behavior, or personality elicits distinctive responses from others. Reactive interactions refer to people who encounter the same situation but interpret and respond to it differently. Examples include academic failure and the separation of parents, and their variable meaning at different life stages. Proactive interactions refer to the selection of environments such as friendships.

Transitional experiences across the life course involve individual initiatives, situational constraints and opportunities, the dispositions and prior experiences that people bring to new situations, and the influence of others. Though many factors influence lives, young people play an important role in constructing their own lives though the choices they make.

The Principle of Human Agency: Individuals Construct Their Own Life Course through Choices and Actions They Take within the Opportunities and Constraints of History and Social Circumstance

Elements of human agency have been prominent in studies of lives (see Haidt & Rodin, 1999; Thomas & Znaniecki, 1918–1920) and are central to studies that relate lives to broader social contexts. People make choices in constrained situations that enable them to exert a measure of control over their life course. These choices ensure a degree of *loose coupling* between social transitions and life stages. Even during the economic turmoil and distress of the 1930s, mothers found jobs amid scarce options, while many of their children carried responsibilities in the home and community. When deprived parents moved their residence to cheaper quarters and sought alternative forms of income, they were involved in a process of "building a new life course." One part of this process appears in the response of young people to needs in the family economy. As noted earlier, they were called on to meet the increased economic and labor needs of deprived households, and a large number managed tasks in the family and earned money on paid jobs.

The initiative of Depression youth from financially strained families is much the same among contemporary youth in an Iowa longitudinal study of rural hardship (Elder & Conger, 2000). This pioneering study began in the late 1980s with 451 farm and small town adolescents and their families in the north central region of Iowa, United States. The adolescents are now in their late 20s.

Children of deprived rural families in this region assumed more responsibilities such as unpaid chores and work on the farm. Boys and girls also sought paid work when faced by the time and labor pressures of both large households and economically distressed farm families. Whether living on a farm or not, working adolescents tended to describe themselves as industrious and efficacious, more so than other youth. Many of these young people would eventually have to seek their fortunes in other communities, and we know that the movers were among the more capable members of the younger rural generation. Youth with migration intentions had done well in school, but they perceived dismal life chances in their local region.

Choice making in migration is vividly expressed in Hagan's (2001) account of American war resisters during the Vietnam War, and their troubled decision to take the "northern passage" to Toronto, Canada, a legal sanctuary from the American selective service system. Nearly 10,000 men chose to defy the military draft and the counsel of their families, and some made this journey with female friends. A majority continued their protest of the war along the way and in their northern community. Though many years removed from the Vietnam crisis, former war resisters (a majority of whom still reside in Canada) remembered the emotional complexity and discord of their decision process. War resisters made their decision to settle in Canada after countless appeals and protests, knowing the moral stigma of their action in the American public. Interviews recall this traumatic time and the process by which "each decision against service in the war" constructed a deviant path from the perspective of American society. This was a different path from that followed by siblings. They were more likely to be employed in human service and artistic professions, and they ended up with lower earnings, but this inequality stemmed more from their prolonged involvement in war protests and the world of activism, which also altered their sense of self and relationships with family and friends.

Does "planfulness" make a difference in the quality of life choices and agency? In *American Lives* (1993), John Clausen focused on this question, with emphasis on the formative adolescent years of Californians who were members of the Oakland and Berkeley Guidance Studies. He hypothesized that competent adolescents who think about the future with a sense of personal efficacy are more effective in making sound choices and in implementing them during the transition to adulthood. These more "planful decisions" lead to greater success in work and family through adulthood. Planful competence was defined by three dimensions: (1) self-confidence, (2) dependability, and (3) intellectual investment. A competent adolescent is equipped with the self-discipline to pursue chosen goals and has the ability to evaluate personal efforts accurately as well as the intentions and actions of others, using an informed knowledge of self, others, and plausible options. Clausen found that the highly competent males in adolescence were most likely to achieve a successful start through education, occupational careers, and family, apart from the influence of IQ and class background. Moreover, this beginning anticipated achievements across the life course, even into the 60s. The young men with a planful competence were more likely to have stable marriages and careers and tended to find satisfaction and fulfillment during their final decades. The planfully competent also ranked highest on the stability of their personality across the years.

Do these findings reflect the special circumstances of the study members' early adult years—the beginning of World War II and an unparalleled era of prosperity? Postwar benefits for veterans encouraged them to obtain a college education, but what if we stepped back a decade of two so that both a Great Depression and global war loomed ahead? To do this, we turned to the Lewis Terman data archive (Holahan & Sears, 1995), a longitudinal study of the brightest Californians. This study of talented children was launched in the 1920s, a time when California's economy seemed to offer unlimited opportunity. Half of the children were born before 1911, the other half by the early 1920s. By selecting only the most able of California's children for the study, Terman could direct his attention to great promise and the expected rise of talent to positions of accomplishment and leadership.

But history changed this trajectory (Shanahan & Elder, 2002; Shanahan, Elder, & Miech, 1997). The older cohort had completed most of its post-high school education by the stock market crash and looked ahead to a stagnant and declining labor market, while the younger men faced the prospects of going to college in the later years of the Depression decade. Lacking good job prospects, a substantial number of the older men stayed in graduate school, extending their list of degrees. By contrast, World War II reduced significantly the educational opportunities of the younger men, while having no impact on the education of the older men who were well past the college years.

With these different historical paths in mind, it is not surprising that planful competence in adolescence had much greater relevance for the future of the younger men, when compared to the older cohort. The planfulness of the older men in adolescence had no effect on their chances for advanced education and career achievement. In large part, this outcome reflects the process of "warehousing" in which the young prolong their stay in school during economically troubled times. School persistence had less to do with personal motivation than with a way of getting out of hardship situations. Life constraints and the timing of careers shape the choices of human agency.

The Principle of Timing: The Developmental Antecedents and Consequences of Life Transitions, Events, and Behavior Patterns Vary according to Timing in a Life Course

Lifelong processes of human development and human agency underscore ways of thinking about the timing of lives and their social contexts. As Bernice Neugarten (1968) has shown in her pioneering work, people do not march through life in concert. They tend to vary by the age at which they pass through life transitions—when they begin and complete their schooling, enter a first job, establish an independent domicile, share a household with a friend, marry, have children, see children leave home, and lose their first parent. They also vary in when they perceive themselves as young, middle age, and old.

In *Children of the Great Depression* (Elder, 1974/1999), some members of their cohort entered marriage before their twentieth birthday, while others were still unmarried a decade later. Early marriage tended to produce life disadvantages, from socioeconomic hardship to the loss of education. Early childbearing had similar consequences. All of these age variations or differences can make a difference by setting in motion a dynamic of cumulative events and processes. To illustrate this point, we turn to the ages at which children experience the breakup of their family and engage in behaviors that initiate a sequence of disadvantage.

No time is a good time for a child's loss of a parent through separation or divorce, but the child's age when such change occurs can make an important difference in its consequences. To address the impact of a single-parent household, Krein and Beller (1988) matched mother-daughter and mother-son samples from the National Longitudinal Surveys to investigate three relevant hypotheses: (1) the transition to single-parent status is most damaging during the early preschool years, owing to heavy time demands; (2) duration of residence lessens the educational achievement of offspring by diminishing social resources; and (3) boys are likely to be more impaired by the change than girls, owing to modeling processes (see also McLanahan & Sandefur, 1994). Although Krein and Beller designed precise measures of the age and length of time a child lived in a single-parent household, the reports of family structure are retrospective because the mothers were interviewed between the ages of 30 and 44. The offspring were interviewed when they were 14 to 24 years. However, such retrospective reports are reasonably accurate.

The study found that timing mattered, along with duration and gender: (a) the adverse effect on education was much greater for the preschool versus the later years, (b) the adverse effect increased with the number of years a child spent in a single-parent household, and (c) the adverse effect was more negative for males than for females. The strongest and most consistent timing and duration effects were obtained among White males, with family income controlled. Black females and men were next in line on effects, followed at some distance by White females. Whether family income was controlled, the timing and duration of living in a single-parent household mattered least for White females. The meaning of this result was not pursued in the study, although these young daughters of single-parent mothers may be protected by maternal support and the model of a self-sufficient woman. Little is known about the actual life history of family structure and the timing of a child's exposure to different phases.

Social disadvantage though family dissolution, erratic parenting, and low socioeconomic status plays an important role in channeling youth toward involvement in antisocial behavior (Sampson & Laub, 1993). The early timing of this involvement increases the risk of a persistent pattern of such behavior. Thirty-five years ago Lee Robins (1966) found that antisocial boys were likely to enter unskilled jobs and experience spells of unemployment, short work weeks, and an unstable marriage. More recently, a study of ill-tempered boys in the Berkeley Guidance Study found them to be at risk for the very same kind of disorganized life course (Caspi, Elder, & Bem, 1987). They were not able to maintain social relationships or jobs. Sequences of adverse events are part of a cumulative process of life disadvantage. Just how this process unfolds is a subject of much theorizing and research. Patterson (1996) views the process

as a cascade of secondary problems such as school failure, depressed mood, and parent rejection. An early history of antisocial behavior is linked to late adolescent conduct through such processes.

From this research and studies into the adult years, three markers along a disadvantaged life course emerge: (1) age at first arrest, (2) incarceration or jail time, and (3) unemployment. In combination, they underscore the importance of "onset timing for deviant activities." The earlier the age at first arrest the greater the likelihood of a criminal career (Farrington et al., 1990). Age at first arrest is a reliable predictor of this future because it sharply increases the likelihood of chronic, violent, and adult offending and the risk of incarceration. Though incarceration is a popular response to the crime problem, jail time appears to be a large part of the problem itself, owing to its role in expanding the disadvantaged population. Using both nationwide and local samples, Freeman (cited by Sampson & Laub, 1996) reports that in all analyses "having been in jail is the single most important deterrent to employment." This finding held up even with adjustments for individual differences that account for unemployment.

An early onset trajectory is defined as a rule by a first arrest before the age of 14. Studies to date link early onset with an earlier onset of antisocial behavior (Patterson & Yoerger, 1996). Perhaps as early as age 6 or 7, a breakdown in parenting processes increases coercive actions (e.g., talking back, explosive behavior, or hitting). The resulting interchange leads to fighting, stealing, and truancy. Antisocial actions that are prototypic of delinquent acts, such as stealing from parents and hitting them, increase the risk of delinquency through the medium of deviant friends. The later onset of deviant behavior includes more conventional youth who are or might be seen as "transitory delinquents." They are more antisocial than uninvolved youth, but not as antisocial as the early onset youth. Patterson and Yoerger conclude that the most intriguing thing about the late-onset boys is that they tend to be more deficient in social skills than are the early onset boys. They regard this as key to predicting which boys will persist in adult crime and which boys will not.

The profound life-course implications of early involvement in antisocial behavior continue to focus empirical work on the dual pathways hypothesis (Farrington & West, 1990; Moffitt, 1993; Moffitt, Caspi, Dickson, Silva, & Stanton, 1996; Nagin, Farrington, & Moffitt, 1995). In the Dunedin longitudinal study, Moffitt (1993) defined two groups with scales and interviews: childhood and adolescent onset of antisocial behavior. With associates, she has followed the males up to their 26th year (Moffitt et al., 2002), a time that is still prior to the median age at first marriage for males in New Zealand. At this age, the childhood group shows the most elevated pattern of psychopathic personality traits, problems of mental health, violent and drug-related crime, substance dependence, and financial-work problems. Adolescent-onset delinquents were less extreme on these measures. Neither group of young people reveal turning points in behavior, perhaps owing to their continuing status in the maturity gap before an established adulthood. Entry into quality jobs and marriages may still produce such turning points, as Laub and Sampson (2003) have shown in their long-term study of delinquent youth and their divergent adult lives.

In life-course theory, age at onset of antisocial behavior is most appropriately expressed as a continuous, time-dependent process. From research to date, one would expect causal factors during the early years to feature neurological and social skill deficits as well as impaired family processes and indications of extreme distress. In the later years, other factors, such as deviant peer activities, would come to the fore; but when they become prominent may depend on the particular ecology, whether the high-risk environment of the inner city or the network closure of small rural communities. By employing this analytic model, empirical research and not decisions based on potentially different criteria are likely to determine whether and when a break occurs between types of causal influences.

Across the life course, the onset of antisocial behavior or its timing is generally viewed in a matrix of social relationships or linked lives. Indeed, change from a life of crime to a conventional lifestyle typically involves change in a young person's best friends, as prompted by marriage or military service (Laub & Sampson, 2003).

The Principle of Linked Lives: Lives Are Lived Interdependently and Social-Historical Influences Are Expressed through This Network of Shared Relationships

The principles of timing and linked lives address in complementary ways the temporality, process, and context of lives and human development. Interdependent lives highlight the role of significant others in regulating and shaping the timing of life trajectories through a network of informal control. This network can be

thought of as a "developmental context" (Hartup & Laursen, 1991) and as a "convoy" of significant others through life (Antonucci & Akiyama, 1995). Whatever the plans of an individual, these "significant others" initiate or experience life transitions that produce transitions in his or her own life. As Becker once observed (1964), the expectations and informal sanctions of these "others" channel behavior and the life course in certain directions.

Linked lives are expressed in *Children of the Great Depression* (Elder, 1974/1999) across the generations, in the parental marriage, and in the relationship of parents and siblings. Older and younger siblings influence each other directly through their encounters, whether nurturant, competitive, or conflictual (Brody, 1996). In an African American sample, Brody and associates (2003) found a significant link between the antisocial behavior of older and younger siblings, but it was strongest in disadvantaged neighborhoods that provided abundant opportunities for the younger sibling to express this behavior, when compared to siblings in affluent residential areas. Examples of an indirect path include the experience of parents with the eldest child that undermines or strengthens their sense of competence in parenting. A third potential sibling link involves the differential treatment of siblings by parents, relatives, or teachers. Little is known about continuity and change in sibling relations from childhood into the adult years.

Marriage and the mutual regulatory influence of each partner illustrate both the process of timing through the synchronization of lives and of the embeddedness of each family member's life. For example, Caspi and Herbener (1990) investigated the influence of marital relations on the developmental trajectories of husbands and wives. In "choosing situations that are compatible with their dispositions and by affiliating with similar others, individuals may set in motion processes of social interchange that sustain their dispositions across time and circumstance" (p. 250). Among marriages with strong ties, they observed trajectories of parallel development over 20 years. Husbands and wives did not change toward greater resemblance in developmental trajectory, but they did show a parallel course of development. When marriages dissolved, the former partners tended to follow less parallel trajectories. A late-life follow-up of Bennington College graduates from the 1930s came to similar conclusions (Alwin et al., 1991). Women were likely to select a college that matched their political beliefs, and they married men with similar beliefs, which sustained their own beliefs into the later years.

Family changes are especially relevant to the principle of linked lives and its implications. Hernandez (1993) refers to a number of revolutionary family changes in the lives of children and adults, including the decline in family size, migration off the land, the growth of women's employment, divorce, and single parenting. Contemporary farm families in the Midwestern region of the United States are characterized by strong community and intergenerational ties, which are weaker for families of farm-reared parents in urban settings. A longitudinal study of families in the north central region of Iowa documents this contrast and the greater social resources of young people with families who have ties to the land (Elder & Conger, 2000). These young people were among the most competent and resourceful adolescents in the study and their accomplishments in school and social leadership had much to do with their social ties to family, church, and community. They were also more engaged in joint activities with their parents and reported stronger relationships with grandparents and teachers. Their social responsibilities fostered a sense of "mattering" to others, a feeling of significance because other people counted on them. In this social world, linked lives regulated and empowered personal development, a social control that could also take the form of barriers to residential change and access to new opportunities in other places.

The experiences and attributes of one generation, such as parental work values, are passed on to the young through relationships between the generations. For example, drawing on the Youth Development Study, Ryu and Mortimer (1996) found parental work experiences and values to be correlated with the work values of children. Mothers' extrinsic work values (such as on money, security) fostered similar values in the lives of their teenage and young adult daughters, and mothers with strong intrinsic values (including work autonomy and interest in job) were least likely to have daughters who valued extrinsic rewards such as high income and status. For sons, the supportiveness of parents mattered more than parents' actual work values and occupational experience. The more supportive the father and mother, the stronger the son's intrinsic values. Intergenerational relations are an important medium for the transmission of work values.

Interdependent lives also extend beyond the family to friends, teachers, and neighbors. Theories of resilience

commonly assume that positive influences can offset negative influences (Luthar, 2003; Werner & Smith, 2001). A positive school environment of classmates and teachers might compensate for a child's punitive family environment or a drug-infested neighborhood. Relevant to these issues is a short-term longitudinal study of adolescents in Prince George's County in the Washington, DC, area (Cook, Herman, Phillips, & Settersten, 2002). The influence of nuclear families, friendship groups, schools, and neighborhoods was assessed in the lives of mainly African American and European-American students in the seventh and eighth grades during the early 1990s. The quality of all four contexts had independent and additive influences on adult success, defined by a composite of school performance, social behavior, and mental health indicators. No reliable interaction effects were observed among the four contexts. The effect of any one context was not large, but the total contextual effect proved to be substantial.

Conventional approaches to the study of peers or friends, as linked lives, have viewed the relationship only from the perspective of the child or adolescent. The perspective of the "other" has seldom been assessed. Studies have also ignored the developmental history of friendship and peer experiences. Bearman and Brückner (1999) address both of these deficiencies in their investigation of girl's friendship and peer group as contributing factors to sexual experiences in adolescence. Their study, based on the National Longitudinal Study of Adolescent Health, provides evidence of the positive influence of peers at multiple levels. Both adolescent girls and their friends were classified as high risk or low risk by school orientation and success as well as by evidence of health-risk behavior such as drinking, skipping school, and fighting. A girl's own risk was less important for her first sexual intercourse and pregnancy than the risk of her male and female friends. Moreover, the age of a girl's friends tended to be more important than her own age. Girls with older friends were more likely to engage in sexual intercourse. Moreover, a girl's circle of close friends and her wider peer network mattered more than her best friends. These effects were predominantly protective. Girls who had low-risk friends among their close circle of friends or in their peer group were less likely to have sex or experience a pregnancy.

A young girl's pregnancy can have consequences that fundamentally change the lives of her mother and grandmother, among others. When a 13-year-old has a child, her 28-year-old mother becomes a grandmother, and her grandmother becomes a great-grandmother. Using data on 41 female lineages from urban multigenerational African American families in Los Angeles, Burton (1985; Burton & Bengtson, 1985) has creatively explored the ripple effects of teenage pregnancy across the generations. The age ranges of respondents in the early lineages were 11 to 18 for the young mothers, 25 to 38 for the grandmothers, and 46 to 57 for the great-grandmothers. The other lineage units were judged on time in transitions. The age ranges for mothers, grandmothers, and great-grandmothers were 21 to 26, 42 to 57, and 60 to 73, respectively.

Role transitions that were "on time" were generally welcomed. One 22-year-old mother commented that she had become a mother "'at the right time': I was ready, my husband was ready, my mother was ready, my father was ready, my grandmother couldn't wait." By comparison, early transitions multiplied social strains and deprivations in the family system, all reflecting the violation of expectations. With few exceptions, the young mothers expected their own mothers to help care for their child. However, this expectation never materialized in four-fifths of the cases, in part because the mothers felt that they were too young to become a grandmother. As one woman put it, "I can't be a young momma and grand momma at the same time. Something seems funny about that, don't you think?" A good many of the mothers resisted the grandparent identity because it conflicted with their availability as dating and sex partners.

The refusal of mothers to become grandmothers, with their normative child care expectations, led most of the young mothers to shift these duties to their grandmothers, now the baby's great-grandmother. Some of these women felt that the change made their life go by too fast. In the words of a woman beset by too many claims, "I ain't got no time for myself. I takes care of babies, grown children, and old people. I work too . . ." Some of these newly promoted great-grandmothers felt they had to put their lives on hold until "the older generation died or the three younger generations grew up." The repercussions of this ill-timed pregnancy across the generations underscore the price of interdependent lives and the support they may provide.

The Principle of Historical Time and Place: Individual Life Course Is Embedded in and Shaped by Historical Times and Places over a Lifetime

Children of the Great Depression (Elder, 1974/1999) is based on children who were born and reared in a specific

historical time and place, defined by culture, social institutions, and diversity of people—the 1920s, the San Francisco East Bay, California. The book also describes a very different Depression experience in Great Britain, Germany, and Japan. Even in the United States, conditions during the Great Depression varied among cities, East and West, and between rural and urban places. In view of this variation, the study's generalizations are uncertain. Also uncertain are generalizations across historical time such as periods of economic depression and recession.

One of the best examples of both historical and spatial variations in the life course and human development comes from studies of lives during military times. The immediate years after World War II, for example, were hard times in many parts of Europe and Asia, unlike the prosperity experienced in the United States. American children who grew up in financially strained families during the Great Depression frequently saw military service as a "bridge to greater opportunity." However, the age at which they entered the service made a difference in how it affected their lives. When appraised in terms of costs and benefits, military service for Americans has favored the recruit who entered shortly after completing secondary school. This time of recruitment comes well before commitments to higher education, a marriage partner, children, and a line of work.

By contrast, later recruitment tends to disrupt all of these activities. Empirical research (Clipp & Elder, 1996; Elder, 1986, 1987; Elder, Shanahan, & Clipp, 1994; Sampson & Laub, 1993, 1996) has documented the life-course advantages of early mobilization and the disadvantages of relatively late entry, quite apart from the mental health and mortality effects of wartime combat. The disadvantages include family disruption, prolonged father absence (Stolz, 1954), family discord, and divorce (Clipp & Elder, 1996), but these are not due to the mental and physical wounds of wartime combat. Exposure to heavy combat markedly increased the likelihood of emotional and behavioral problems after leaving the service, but such problems were not concentrated among the late entrants. Before getting into the details of selected studies, we note some basic features of the transition to military service, in eras of World War II, the Korean conflict, and the Vietnam War.

First, military service tended to pull young people from their past, however privileged or unsavory, and in doing so it created new beginnings for developmental life changes. Basic training defined a recruit's past as irrelevant. This definition encouraged independence and responsibility, separated recruits from the influence of their home community and family, and allowed a degree of social autonomy in establishing new ties. Basic training also promoted equality and comradeship among unit members, made prior identities irrelevant, required uniform dress and appearance, minimized privacy, and rewarded performance based on group achievement.

A second distinctive feature involves "a clear-cut break from the age-graded career," a time-out in which to sort out matters and make a new beginning. Military duty legitimized a time-out from education, work, and family, and liberated the recruit from all conventional expectations for an age-graded career, such as expectations regarding progress and life decisions.

Just being in the armed forces released the recruit from probing life-decision questions from parents (e.g., Have you decided on a job or career? When will you be promoted or get married?). As Samuel Stouffer and his associates in the American Soldier study (1949, Vol. 2, p. 572) noted, for many soldiers in World War II, "perhaps for a majority, the break caused by Army service [meant] a chance to evaluate where they had gotten and to reconsider where they were going." This time-out would be far less timely for men and women who were mobilized in the midst of family and career responsibilities.

A third feature of mobilization offered a broadened range of developmental experiences and knowledge, including exposure to in-service skill training and educational programs, as well as exposure to new interactional and cultural experiences through service itineraries that extended across the country and overseas. Out of such experiences came a greater range of interpersonal contacts, social models, and vocational skills. Horizons were broadened and aspirations elevated. A veteran interviewed just after World War II (Havighurst, Baughman, Burgess, & Eaton, 1951, p. 188) commented about the remarkable diversity of his acquaintances in the service and their influence on his views. As he put it, the experience "sort of opens up your horizons. . . . You start thinking in broader terms than you did before." Post-World War II veteran benefits, particularly the GI Bill, gave significant support for these new aspirations.

The creation of new beginnings, a time-out or moratorium to rethink and rework one's future, and a broader range of skills, interpersonal contacts, and cultural experiences do not exhaust important features of military experience for new entrants, but in combination they define a bridge to greater life opportunity and a potential

turning point, especially for disadvantaged youth. As a total institution that presses from all angles, the military is uniquely suited to recasting life trajectories. Indeed, many years ago, Mattick (1960) found that young men paroled to the army had a much lower recidivism rate than civil parolees. Features of basic training and the transition to military service have been adopted over the years by social interventions, most especially by the Civil Conservation Corps in the 1930s.

Early entry into the military tends to minimize life disruption and maximize such life-course benefits as vocational education, skill training, and the GI Bill of support for veterans' education and housing. In both the Oakland Growth and Berkeley samples (1986, 1987), with birthdates in the 1920s, young men with disadvantages of one kind or another were likely to join up as soon as they could. Three types of disadvantage were especially consequential: (1) membership in an economically deprived family, (2) poor high school grades, and (3) feelings of personal inadequacy during adolescence. In combination, these factors predicted early entry into military service and its pathway to personal growth and greater opportunity. Early entrants show greater life benefits of the service up to the middle years than did later entrants.

Military service offered greater life development among the early entrants in two ways. One route involved situational changes that made these recruits more ambitious, assertive, and self-directed by midlife (Elder, 1986). The second route involved extensive use of government educational and housing benefits through the GI Bill. This important legislation, which has been likened to a Marshall Plan for America, was available to recruits up through the age of 25. Early recruits in the Oakland and Berkeley cohorts were most likely to take advantage of these benefits for training and a college education (Elder, 1986, 1987).

Though initially more disadvantaged, the early entrants at least matched the occupational standing of the nonveterans at midlife, and the Berkeley males from deprived families showed greater developmental gains up to the age of 40. Using Q-sort ratings of personality in adolescence and at midlife (Elder, 1986), the study found that the early entrants displayed greater change toward self-direction and confidence than the later entrants. The mental health risks of combat exposure did not alter this effect of life stage and timing in the two cohorts.

Involvement in the military helped to account for why men from financially strained families in the 1930s have fared well in their adult years, matching if not exceeding the occupational accomplishments of adults from more privileged backgrounds. However, the military experience itself has remained largely a "black box" and a subject of informed speculation. What were the mechanisms of developmental change? Sampson and Laub (1996) provide some answers to this question in a compelling test of the early entry hypothesis. They use life-record data on a sample of approximately 1,000 men who grew up in poverty areas of Boston (birth years, 1925 to 1930), and more than 70% of the men served in the military. Sheldon and Eleanor Glueck (1968) originally designed the longitudinal study of delinquency with a matched control sample—500 delinquents and 500 controls.

The delinquent sample of White males, ages 10 to 17, was drawn from a population of youth who were committed to one of two correctional schools in Massachusetts. The matched controls (on age, IQ, race-ethnicity, and neighborhood deprivation) included 500 White males from the Boston public schools, also ages 10 to 17. The two samples are treated in all analyses as independent. From 1940 to 1965, the Gluecks collected a rich body of life-history information on the study members. With a particular eye to experiences in the military, they assembled unparalleled details on the men's service experience—their in-service training programs, special schools, exposure to the military justice system, and arrests. The life-record data on the sample of delinquents have also been coded by Sampson and Laub.

Men in the delinquent and control samples typically entered the service at the age of 18 or 19 years, and most served over 2 years (more than 60% overseas). Consistent with their history, men from the delinquent sample were far more involved in antisocial conduct during their service time than the controls (official misconduct, number of arrests, dishonorable discharge), and they were less likely to experience in-service training and benefits from the GI Bill. Nevertheless, men from the delinquent sample were more likely to benefit from the service over their life course, when compared to the controls, and this was especially true for men who entered the service at an early age. In-service schooling, overseas duty, and use of the GI Bill significantly enhanced job stability, economic well-being, and occupational status, independent of childhood differences and socioeconomic origins. However, benefits of the GI Bill were larger for veterans with a delinquent past, especially when they entered the military at an early age. The significant

benefits of the GI Bill and overseas duty on socioeconomic position were observed across the adult years up to the age of 47.

In combination, these findings provide consistent support for the life-course advantages of early entry into World War II, and one study suggests that it applies as well to the Korean War (Elder, 1986). However, ecological context matters, as one might expect. The timing of military service had very different effects in countries that lost World War II, specifically Japan and Germany. West German males, born between 1915 and 1925 were drawn very heavily into military action (up to 97% of an age cohort—Mayer, 1988, p. 234). These cohorts of veterans lost as many as 9 years of their occupational career in the war, suffered a high rate of imprisonment during and after the war, and experienced a mortality rate of 25%. German children born around 1930 were also hard hit by the war years, according to data from the German Life History Project (Mayer & Huinink, 1990, p. 220). The war disrupted their families and education and they entered the labor market in a war-devastated economy. Work placements were often poor, mixed with spells of joblessness, and advancement was unpredictable. Even the economic boom after the deprivational years of recovery did not fully compensate this younger cohort for its wartime losses in occupational achievement. A similar story is told by these two birth cohorts (circa 1920 and 1930) in Japan (Elder & Meguro, 1987), except that the younger group was mobilized as students for work in the fields and factories. A large number reported bomb-damaged homes and a forced evacuation to the countryside.

Today, military service occurs in a very different life course, marked by a later entry to adulthood for the college-oriented (Settersten et al., 2005). The nature of this service has also changed in many places, from obligation to voluntary. The aging of human societies has extended the transition to young adulthood, from family origins in adolescence to the establishment of a family in the early 30s or even later. In the United States, young people are entering adulthood at a time of rising educational requirements and later family formation for the middle class especially. This contrasts with an accelerated timetable for the working class and families in poverty—their transition events tend to occur much earlier.

We have used military service to illustrate the role of historical time and place in lives. Military service functioned as a trajectory out of disadvantage in the lives of Depression youth who survived World War II, but this escape was conditional on historical time and place: Opportunities and life itself were lost by countless youth in Europe and Asia.

Contributions of Life-Course Theory to the Study of Human Development

In combination, these paradigmatic themes of life-course theory identify its core features and potential contributions to the study of human development. First, this perspective places the field of study in a lifelong framework. Human development and aging are lifelong processes, expressed in continuity and change, and biological, social, and psychological terms. The early years of child development have formative implications for subsequent trajectories and healthy adaptations in later life. In the course of aging, individuals change their environment and social pathways by differentially interpreting, selecting, and assigning meaning to situations and personal experiences. This process is expressed by the principle of human agency—life-course choices are made in structured situations. Across the life course, pathways also shape the behavior of individuals through social demands and challenging options. Contexts and individuals thus become correlated. Transactional processes of this kind are established early in life and contribute significantly to life-course continuity. Life changes tend to occur when situational demands change and pressures increase to alter one's life course (e.g., marriage and military induction).

Few conceptual distinctions are more relevant to an understanding of developmental change and the lives of children than the link between age and timing. Thus, the full negative impact of a lengthy dependence on welfare for the educational progress of African American children appears after the third grade (Guo, Brooks-Gunn, & Harris, 1996). Cumulative dependence on welfare markedly tends to increase the risk of grade retention from the third to the ninth grades. Age and timing distinctions also enable studies to relate children to the life course of significant people in their lives. Middle-aged parents and their biographical experiences are an integral part of the adolescence of their children, and the experiences of youth figure prominently in the social world of their parents. In social meaning or function, parents remain parents for as long as they and their children live. Likewise, the significant relationship of grandchildren and grandparents can have much to do with the quality and pattern of their own lives. Lives

and developmental trajectories are thus embedded in a moving system of intergenerational relationships.

As a theoretical orientation or framework, the life course provides a conceptualization of the maturing individual's changing environment and its developmental relevance. This formulation locates children and their families in historical time and place. Cultural scripts and social structure play an important role in organizing human lives as life courses, along with the actions of people and the internal forces of self-regulation. In theory, macrochanges influence developmental processes by altering the individual life course through multilevel processes and social structures. For children growing up in the Great Depression, hard times shaped their life course by changing their family's experience and trajectory. Historical influences were filtered by their cohort membership and social class in 1929 and by their actual exposure to severe income loss as expressed in family adaptations. Place also made a difference because the economic collapse hit the eastern half of the United States before the western coast.

INTEGRATING BIOLOGICAL MODELS WITH THE LIFE COURSE: A PROMISING FRONTIER

New developments in the study of behavior and biography offer exciting possibilities for life-course studies. Research on neighborhoods and communities (Morenoff, 2003; Sampson, Morenoff, & Gannon-Rowley, 2002), autobiographical memory (e.g., Fivush & Haden, 2003), and subjective understandings of the self (Macmillan, Hitlin, & Elder, in press) have become increasingly sophisticated. Substantial progress has also been made toward integrating the stress paradigm with life-course principles (Elder, George, & Shanahan, 1996; Wheaton & Clarke, 2003). Advances such as these depend not only on novel data collection efforts but also on theory that directs attention to behavioral patterns as they vary by place, time, and age.

The study of biological processes and behavior illustrates this need for integral models that encompass social settings and development. As explosive as interest may be in biological studies of behavior, this work—encompassing evolutionary processes, metabolic processes associated with the endocrine and immune systems, genetics, and neuroscience—has not fully appreciated the importance of context and its dynamic features, the core insight of life-course theory. If behavioral development reflects ongoing exchanges between person and context, then its fully informed study necessarily involves longitudinal views of both biological and social processes. Thus, integration of the life course with biological models of behavior represents an emerging and highly promising area of study.

Such integration is facilitated by two considerations. First, many topics of interest to life-course studies are linked in significant ways to biological processes. These topics include, for example, trajectories of physical and mental health, the stress process, patterns of aggression and deviance, sexual behavior, fertility, parenting, and manifold dimensions of aging and mortality. Second, other topics are also likely to be associated with biological processes, albeit less conspicuously, including educational and occupational careers, patterns of close interpersonal relationships both within and beyond the family, and one's involvement and status in organizations.

Further, biological models of behavior have undergone nothing short of a paradigm shift in the past few decades, moving from biological determinism to the widespread assumption that "nature and nurture" interact in complex ways. This new view is consistent with propositions of systems theory (Lerner, Chapter 1, this *Handbook,* this volume), several of which are especially relevant to a discussion of biology and the life course. First, human behavior is the product of multiple levels of analysis, including, for example, levels characteristically associated with sociology, psychology, biology, and anthropology. By extension, there is no *a priori* reason to believe that any one level will have special explanatory value. For example, genes do not simply cause behavior (see Gottlieb et al., Chapter 5, this *Handbook,* this volume) and, at the same time, behavior is not purely a result of social forces.

Second, all levels of analysis are characterized by plasticity, which refers to the range of possibilities (Lerner, 1984). Thus, each person's behavior represents one set of possibilities from among a finite range of possibilities; similarly, every social order represents one form of organization out of a range of possible social orders. Third, although each level is likely to operate according to its own laws, the levels interact to produce behavior (Cairns, McGuire, & Gariepy, 1993). That is, systems theory assumes that many factors at multiple levels interact to form sets of "correlated constraints" that include the behaviors of interest and their covariates.

These behaviors and their covariates represent organized systems, and ongoing reciprocal interactions among their levels explain continuity and provide a map of opportunities for change.

When viewed jointly, these principles define a central theme of genetic, metabolic, and evolutionary approaches to behavior: Social and biological forces interact in complex and dynamic ways to define ranges of likely behaviors. By itself, this theme acknowledges the importance of context and its interplay with biology. Yet, a second overarching theme links biological models of behavior to the life course more directly: Behavior reflects a lifetime of reciprocal exchanges between person (including biological makeup) and context. This theme acknowledges that behavior cannot be fully understood without reference to prior experience. To explore these themes, we focus here on behavioral genetics and the life course (for discussion of the life course and evolutionary and endocrinological processes, see Shanahan, Hofer, & Shanahan, 2003).

Virtually all research on the life course has proceeded without considering the influence of genes on behavior, and, at the same time, behavioral genetics has proceeded without regard to the sophisticated models of social context that often characterize life-course research. Many lines of research have now established, however, that genotypes do not produce behaviors in a simple way (see Gottlieb et al., Chapter 5, this *Handbook,* this volume). Rather, phenotypes are likely to reflect the cumulative history of the individual's genotype (i.e., the genetic make-up of the organism), phenotype (i.e., any observable feature of an organism, including its behavior), and context. Indeed, there is widespread appreciation among behavioral geneticists that the links between genotypes and phenotypes are often heavily conditioned by social location and personal experiences. What is insufficiently appreciated is that the dynamic features of context often determine its meaning for the person. Put differently, the significance of social context for genetic expression will often depend on processes occurring in the life course as revealed by, for example, pathways, trajectories, transitions, turning points, and durations. One of the forefronts of behavioral genetics—gene-environment interactions—provides a useful example of this principle.

Mechanisms of Gene-Environment Interaction

Gene-environment (GE) interactions occur when genes alter the organism's sensitivity to specific environmental features or environmental features exert differential control over genetic effects (Kendler & Eaves, 1986). That is, genes may or may not be expressed depending on the context, or the effect of context may depend on the genotype. Many students of human behavior, development, and aging believe that the study of GE interactions will promote a better understanding of complex human behaviors (e.g., McClearn, Vogler, & Hofer, 2001; McGue, 1999; Rowe, 2001; Rutter & Silberg, 2002; Sawa & Snyder, 2002; van Os & Marcelis, 1998; Wahlsten, 1999). Yet, few empirical examples of GE interactions have been identified in the study of behavioral phenotypes in humans, and failures to find such interactions have been noted (e.g., Heath et al., 2002; McGue & Bouchard, 1998, p. 12).

Part of this discrepancy between the presumed commonality of GE interactions and the infrequency of their detection undoubtedly reflects methodological difficulties (e.g., power issues, levels of measurement, over-reliance on cross-sectional designs), or over-simplified conceptualization and measurement of social context. What is it about social context that would interact with the genotype to produce behavior? To date, four social processes have been identified (Shanahan & Hofer, 2005).

First, social stressors may *trigger a genetic diathesis,* as is found, for example, in numerous studies of life-events that trigger various forms of depression among people at high genetic risk for internalizing problems (e.g., Kendler & Kessler, 1995; Silberg & Rutter, 2001). Second, social context may *compensate for a genetic diathesis,* which means that the absence of notable stressors or the provision of an enriched environment may prevent the expression of a genetic risk. For example, people at genetic risk for depression but not experiencing life-events typically do not exhibit depression. Studies of mice show that enriched settings can completely compensate for genetic risks for cognitive tasks that are necessary to negotiate a maze (Rampon, Tang, Goodhouse, Shimuzu, & Tsien, 2000; Rampon & Tsien, 2000).

Third, social context may also *prevent the expression of a genetic risk through social control processes.* Numerous studies show that sources of social control—for example, religion, monitoring, anonymity, cultural values and norms—lead to lowered levels of alcohol consumption despite a genetic propensity or, conversely, high levels of consumption in the absence of genetic inhibitors to drinking (e.g., Dick & Rose, 2001; Higuchi et al., 1994; Koopmans & Slutske, 1999). Finally, Bron-

fenbrenner and Ceci's (1994) bio-ecological model suggests that *proximal processes encourage the actualization of genetic potential:* As proximal processes—enduring forms of social interactions characterized by progressive complexity—improve, the genetic potential for positive development is increasingly actualized. For example, Rowe and Jacobson (1999) showed that the heritability of verbal intelligence is significantly greater among high-education households than low. Their results suggest that the genetic potential for verbal intelligence is more fully realized in homes of better-educated parents, which are assumed to provide enriched proximal processes (e.g., Guo & Stearns, 2002).

Gene-Environment Interactions in the Life Course

What is notable about all of these processes is that they occur in the life course or are age-graded experiences that form trajectories or pathways. How can the life course inform the study of genetic expression? First, triggering, compensatory, social control, and proximal processes are all mechanisms that occur over considerable periods, and thus must be studied with life-course distinctions in mind. Second, the nature of these processes is multifaceted and will vary through the phases of life: For example, the factors that constitute social control in childhood differ significantly from social control mechanisms in adolescence, which, in turn, differ from control in young adulthood. The importance of these themes—the dynamic and multidimensional nature of context—can be appreciated when considering existing approaches to context in behavioral genetic research.

Dynamic Patterns of Context

The case of GE triggering interactions involving life-events and depression illustrates the importance of conceptualizing and measuring context through time. As noted, many studies show that life-events are significant stressors that trigger depression in people with a genetic susceptibility for that disorder. Such studies typically ask people to indicate from a list of the life-events that have occurred over a specified period. The total number of life-events experienced is then associated with depression.

Yet, the magnitude of the relationship between life-events and indicators of distress like depression or depressive symptoms is often modest (Turner, Wheaton, & Lloyd, 1995), and the cumulative evidence shows that these modest associations are observed because, in part, the invidious nature of stressors is contingent on the prior, contemporaneous, and subsequent experiences of the person (Elder et al., 1996). In effect, life-events—like all potential sources of stress, compensation, enhancement, and control—can only be understood in the context of the life-course trajectories that embed them.

Indeed, while the vast majority of studies examine the negative implications of life-events for well-being, or the conditions in which such negative effects are attenuated, life-events can actually have *positive* effects on well-being, depending on prior circumstances. For example, Wheaton (1990) shows that severe life-events have a positive effect on psychological well-being if they resolve an antecedent source of chronic distress. Thus, among adults who have lost a spouse, persons with high levels of prior marital problems report significantly less distress than with low levels of prior marital problems. Similar patterns are observed for earlier divorce, premarital breakup, and a child moving out, with qualified evidence for recent divorce, job loss, retirement, and getting married. Wheaton concludes that role histories often determine the meaning of a life-event (for other examples of the positive effects of life-events, see also, Amato, Loomis, & Booth, 1995; Sweeney & Horwitz, 2001).

Furthermore, the experiences of early traumas (including life-events) on later well-being are likely to be contingent on complex patterns of cumulative stressors. Turner and Lloyd (1995) report that the number of cumulative lifetime traumas significantly predicts onset of disorder (major depression or substance abuse) but not relapses of disorders. The number of traumas experienced since the first onset, however, significantly predicts relapses. Controlling recent life-events, the authors find that the number of post-onset traumas and chronic stressors increases major depression and substance use, while the number of pre-onset traumas *decreases* the risk of major depression. The authors conclude that the effects of life-events on distress will be significantly underestimated if life-time patterns of both traumas and episodes of disorder are not taken into account (for the independent effects of earlier and later stressors, see also, e.g., Ensel & Lin, 2000; Hayward & Gorman, 2004; Poulton et al., 2002).

With respect to experiences subsequent to the life-event, research shows that the effects of life-events are often contingent on their implications for later life patterns. For example, in their overview of research on childhood adversity and its effects on adult adjustment,

McLeod and Almazan (2003) note that much of the effect of parental loss (other than by parental separation) is mediated by subsequent experiences. Studies suggest that the provision of good child care, integration into and achievements at school, good peer relations, and supportive, intimate relationships can all act to break the link between parental loss in childhood and poor psychosocial outcomes in adulthood (e.g., Quinton & Rutter, 1988; Rutter, 1989). In adulthood, the effects of life-events are often contingent on how the events are resolved.

While our review of the life-events literature is not meant to be comprehensive, it underscores that the cross-sectional measurement of exposure to life-events represents a crude proxy for increases in stress load that could actually trigger a genetic diathesis for psychosocial distress. Likewise, variables that represent other forms of stressors—as well as potential sources of social compensation, control, and enhancement—are likely to acquire their meaning and impact only when viewed as part of a life-course trajectory. In an effort to enhance the accuracy and validity of their models, behavioral geneticists are beginning to assess behavior in developmental terms. A similarly dynamic orientation is necessary to capture the full significance of social context.

In addition to the dynamic features of experiences, the life course directs attention to the changing nature of social processes through the phases of life. Social context is part of a "cascade of associations" (Johnston & Edwards, 2002) or mediating mechanisms that makes certain behaviors more likely than others. As Rutter and Pickles (1991) observe, a GE interaction is not an explanation but rather something to be explained. For example, Link and Phelan (1995) suggest that socioeconomic status is a "fundamental cause" of well-being, meaning that, as a rule, high socioeconomic status is associated with good health. Nevertheless, the mechanism by which high socioeconomic status has these salutary effects varies considerably depending on the time and place. Socioeconomic status may promote manifold dimensions of well-being and health through, for example, preventative behaviors, monitoring and treatment, the amelioration of stressors, and/or the provision of stimulating, healthy environments. Perhaps all of these mechanisms are at work, or perhaps their importance differs at different points in life.

Sampson and Laub's research (1993) on informal social control illustrates the multifaceted nature of this mechanism. In childhood, informal control refers to a complex range of parenting behaviors, peer relationships, and connections to school and religious institutions. Through adolescence, the importance of these sources may wane to some degree, and close interpersonal relationships and the workplace may increase in importance. Informal social control in young adulthood is often indicated by attachments to the labor force, marriage, parenthood, military service, and religious and civic involvements. Across the phases of life, these sources of control tend to be positively interrelated, although, according to Sampson and Laub, youth experiencing low informal control may have experienced an increase in control during the transition to adulthood. Thus, social control refers to numerous, changing, and interrelated processes through the early life course. For example, it would be a mistake to suppose that measuring parenting before age 5 could capture these complexities.

The Multidimensional Nature of Context

Empirical studies that demonstrate GE interactions almost invariably involve the interplay between an indicator of genetic risk and a dimension of social experience. For example, depression is thought to be responsive to stressors, but research typically examines only one dimension of stressors (such as life-events). A focus on one dimension of context is likely to underestimate the effect of contextual factors, which often operate as "correlated constraints," or groups of variables that co-occur and work interactively. The multidimensionality of context raises two possible sources of complexity.

First, high levels of interaction may characterize indicators of triggering, compensation, control, and enhancement. Highly stressful circumstances (capable of producing GE triggering interactions), constraining circumstances (capable of producing GE social control interactions), and enhanced circumstances (capable of producing GE enhancement or compensation interactions) are likely to reflect manifold aspects of context that exert their influence on the person as a set of variables, not individually. For example, Rutter (1990) suggests that the presence of three or more risk factors predicts maladjustment in an interactive fashion. Likewise, the developmental challenges posed by neighborhoods marked by concentrated disadvantage are numerous, intercorrelated, and likely to exert their negative influences in nonadditive ways. Indeed, in their overview of research on childhood adversities and their implications for adulthood, McLeod and Almazan (2003) observe that:

> attempts to disaggregate the effects of clustered adversities may offer relatively little insight into processes of risk

> and resilience. The different clusters of events that children experience have different meanings that are lost when those events are studied in isolation. (p. 401)

While behavioral geneticists have understandably been interested in gene-gene (GG) and gene-environment (GE) interactions, environmental factors may create *environment-environment (EE) interactions,* whereby groups of contextual factors have nonadditive effects on behavior. Particularly, if only extreme settings will moderate genetic expression (Scarr, 1992), then such environments are likely to involve EE interactions. Regardless of the presence of EE interactions, the high associations observed between contextual variables warrants caution when interpreting bivariate studies that interrelate one genotype and one contextual factor (e.g., Caspi & Sugden, 2003). This point is clear in a study of sexual behavior among adolescents and their peers.

The case of virginity pledges among adolescents illustrates the highly interactive nature of a form of social control in delaying age of first sexual intercourse. Drawing on data from Add Health, Bearman and Brückner (2001) observe that the risk of sexual initiation is 34% lower among youth who took a virginity pledge than among nonpledgers. The effect of pledging is contingent, however, on other contextual features that, taken as a whole, establish controlling circumstances. The others found the pledging effect to be stronger in early and middle adolescence, but it did not prevent sexual intercourse until marriage. In addition, the effect of pledging varied according to the type of school that the student attends, and the percent of pledgers in the school. In "socially open schools"—where many of the students report friendships and romantic relationships with students from other schools—pledging has no effect if no other pledgers are present. In such schools, for every 1% additional same-sex pledgers, the rate of the transition to first intercourse is delayed by 2%. In socially closed schools—where friendships and romantic relationships are contained in the school—the opposite is observed: with no other pledgers present, pledgers are much less likely to experience their sexual debut. When other pledgers are present, the pledgers' transition rate is higher than that of pledgers in schools with few pledgers. For adolescents in schools with more than 30% pledgers, a threshold is reached whereby pledging has no effect. That is, by itself, pledging status tells little of the story of how sexual behavior is controlled. When this form of social control is viewed as a constellation of variables that create EE interactions—encompassing status, type of school, and percent of pledgers in the school—the controlling nature of the context can be more fully appreciated.

Second, the principles of equifinality and multifinality (which states the end phenotype may be the product of multiple, distinct causal pathways and single causes may lead to multiple, distinct phenotypic expressions) are relevant to links between social context and gene expression. For example, Kendler, Gardner, and Prescott (2002) examined the interrelationships among 18 risk factors over the life course (some of which were retrospectively recalled) and depressive episodes. The best-fitting, most parsimonious model included 64 paths among risk factors and the occurrence of major depression, a simple but dramatic example of how multifaceted mediational pathways can be. Distress is known to reflect many different types of stressors, which can, in turn, take on many different forms. Similarly, many specific forms of social control that inhibit antisocial behavior have been identified, including warm and nurturant parenting, positive connections with schools and nonrelated adults, intimate interpersonal relations, marriage, parenthood, and meaningful ties to the labor market (e.g., Sampson & Laub, 1993). These considerations suggest that causal pathways involving social context and biological substrates may involve complex combinations of different factors that lead to the same outcome.

Future Directions for the Life Course and Behavioral Genetics

Taken together, these themes heighten sensitivity to the dynamic, highly contingent, and multidimensional nature of social processes that are likely to be integral to genetic expression. The study of such themes would transform how research typically proceeds in behavioral genetics (Coll, Bearer, & Lerner, 2004). Behavioral genetic research typically views social context in unidimensional, static terms, although life-course research shows that formative social processes exhibit patterns of change and constancy across the phases of life, and these dynamic patterns determine the salience of context for behavior. Integrating life-course models of social processes with behavioral genetic studies thus presents exciting new opportunities for understanding behavioral development in increasingly precise terms.

Ideally, such integrative efforts will capitalize on a long-standing interest of life-course research or the comparison of people across differing social contexts. Such an interest may involve the study of social change,

which involves the transformation of context in people's lives, migration, or cross-national patterns. All of these types of studies provide an advantage in the study of development by creating notable variability in context and behavior. The utility of these approaches is suggested by behavioral genetic studies of alcoholism. For example, Higuchi et al. (1994) show that while the suppressive effect of the *ALDH2*2* genotype (i.e., homozygous for the null allele) inhibits alcoholism among the Japanese, the suppressive effect of the heterozygous genotype (i.e., one null and one normal allele) has waned with successive cohorts. The authors speculate that social controls on drunkenness have loosened in Japanese society through the twentieth century.

The functional polymorphism *ADH2*2* also protects against alcoholism, but its effects may be contingent on context. The fact that Jews drink less than other Caucasians is thought to reflect the fact that *ADH2*2* is more prevalent in the former group. Among Jews, however, the inhibitory effect of *ADH2*2* may be contingent on environmental factors. Although drawing on a small sample, Hasin et al. (2002) report that the effect of *ADH2*2* in suppressing alcohol consumption was less among Russian Jews who had been exposed to an environment of heavy drinking prior to immigration than among Israeli Ashkenazi and Sephardic Jews who had not been exposed to such an environment. This research illustrates how social change and the life course can be strategic in the study of genetic expression because they create "experiments of nature" that dramatically alter the contextual forces thought to alter genetic expression.

CONCLUSIONS

The emergence of life-course theory and its elaboration over the past 30 years can be viewed through prominent challenges to developmental studies that questioned traditional forms of thought and empirical work. They include:

1. The necessity for concepts of development and personality that have relevance beyond childhood and even adolescence
2. The need for a way of thinking about the social patterning and dynamic of lives over time, as they relate to developmental processes
3. The increasing recognition that lives and developmental trajectories may be transformed by a changing society

Each challenge was posed by the early longitudinal studies, as they continued well into the adult and late life years, and the mounting realization that much of the story of child development is written across the adult years. In addition, the challenges had much to do with the demographic and political pressures of an aging society.

Social theories of relationships and age converged in the 1960s with emerging concepts of life-span development to produce a theoretical orientation to the life course. More than any other theoretical initiative, life-span developmental psychology has responded to the first challenge by advancing a conceptual orientation on human development and personality across the life span. One result is a concept of ontogenetic development in which social structures and cultures merely establish behavioral settings. By contrast, life-course theory views human development as a coactive process in which sociocultural, biological, and psychological forces interact over time. Social structures and cultures are constituent elements in the developmental process. People play an important role in shaping their life course and development, although choices and initiatives are always constrained by social forces and biological limitations.

In concept, and as discussed in this chapter, the individual life course provides a response to the second challenge, a way of thinking about life patterns or organization. Lives over time do not merely follow a sequence of situations or person-situation interactions. Instead, the life course is conceived as an age-graded sequence of socially defined roles and events that are enacted and even recast over time. It consists of multiple, interlocking trajectories, such as work and family, with their transitions or changes in states. People generally work out their life course in relation to established, institutionalized pathways and their regulatory constraints such as the curricula or tracks of a school, the age-graded expectations of a family, and the work careers of a firm or culture.

The individual life course, developmental trajectories and transitions (as psychobiological continuities and change), and established pathways are important elements in the life-course study of human development. Any change in the life course of individuals has consequences for their developmental trajectory, and historical change may alter both by recasting established pathways. Thus, adultlike expectations for productive work in World War II communities were lowered toward childhood to enable young people to fill needed

roles. By placing people in historical locations, life-course theory has oriented research to the third challenge, to understand the process by which societal changes make a difference in the primary world and development of children.

This chapter on life-course theory represents the beginning stage of a long journey toward understanding human development in ways that extend across individual lives, the generations, and historical time. Just as the major themes of developmental psychology from a century ago seem to be regaining prominence in contemporary studies (Parke et al., 1994), including a renewed interest in genetic influences, emotional regulation, and the study of hormones, life-course theory can be viewed through renewed priorities (e.g., social context and change, life histories) that were once dominant in the past, particularly in the early Chicago School of Sociology. These observed continuities, however, pale in relation to the novel integrations and new directions of contemporary theory. Building on a wider net of cross-disciplinary scholarship in developmental science, distinctions of time, context, and process have become central to a life-course theory of child, adolescent, and adult development. The integration of biological models with the life course represents a promising interdisciplinary frontier for this field of study.

REFERENCES

Abbott, A. (1997). Of time and space: The contemporary relevance of the Chicago school. *Social Forces, 75*(4), 1149–1182.

Alexander, K. L., Entwisle, D. R., & Dauber, S. L. (1994). *On the success of failure: A reassessment of the effects of retention in the primary grades.* New York: Cambridge University Press.

Alwin, D. F., Cohen, R. L., & Newcomb, T. M. (1991). *Political attitudes over the life-span: The Bennington women after fifty years.* Madison: University of Wisconsin Press.

Amato, P. R. (2000). Consequences of divorce for adults and children. *Journal of Marriage and the Family, 62,* 1269–1287.

Amato, P. R., & Cheadle, J. (2005). The long reach of divorce: Divorce and child well-being across three generations. *Journal of Marriage and the Family, 67,* 191–206.

Amato, P. R., Loomis, S. L., & Booth, A. (1995). Parental divorce, marital conflict, and off-spring well-being during early adulthood. *Social Forces, 73,* 895–915.

Amick, B. C., McDonough, P., Chang, H., Rogers, W. H., Pieper, C. F., & Duncan, G. (2002). Relationship between all-cause mortality and cumulative working life course psychosocial and physical exposures in the United States labor market from 1968 to 1992. *Psychosomatic Medicine, 64,* 370–381.

Antonucci, T. C., & Akiyama, H. (1995). Convoys of social relations: Family and friendships within a life-span context. In R. Blieszner & V. H. Bedford (Eds.), *Handbook of Aging and the Family* (pp. 355–371). Westport, CT: Greenwood Press.

Aseltine, R. H., Gore, S., & Gordon, J. (2000). Life stress, anger and anxiety, and delinquency: An empirical test of general strain theory. *Journal of Health and Social Behavior, 41*(3), 256–275.

Baldwin, J. M. (1895). *Mental Development in the child and the race: Methods and processes.* New York: Macmillan.

Baltes, P. B. (1979). Life-span developmental psychology: Some converging observations on history and theory. In P. B. Baltes & O. G. Brim Jr. (Eds.), *Life-span development and behavior* (Vol. 2, pp. 256–281). New York: Academic Press.

Baltes, P. B. (1993). The aging mind: Potential and limits. *Gerontologist, 33,* 580–594.

Baltes, P. B. (1994, August). *Life-span developmental psychology: On the overall landscape of human development.* Invited address at the 102nd Annual Convention of the American Psychological Association (Division 7), Los Angeles.

Baltes, P. B. (1997). On the incomplete architecture of human ontogenesis: Selection, optimization, and compensation as foundations of developmental theory. *American Psychologist, 52,* 366–381.

Baltes, P. B., & Baltes, M. M. (1990). *Successful aging: Perspectives from the behavioral sciences.* New York: Cambridge University Press.

Baltes, P. B., Cornelius, S. W., & Nesselroade, J. R. (1979). Cohort effects in developmental psychology. In J. R. Nesselroade & P. B. Baltes (Eds.), *Longitudinal research in the Study of Behavior and Development* (pp. 61–87). New York: Academic Press.

Bane, M. J., & Ellwood, D. T. (1986). Slipping into and out of poverty: The dynamics of spells. *Journal of Human Resources, 21*(1), 1–23.

Barrett, A. E. (2000, December). Marital trajectories and mental health. *Journal of Health and Social Behavior, 41,* 451–464.

Bartley, M., & Plewis, I. (2002). Accumulated labour market disadvantage and limiting long-term illness: Data from the 1971–1991 Office for National Statistics' Longitudinal Study. *International Journal of Epidemiology, 31,* 336–341.

Bauer, D., & Curran, P. J. (2003). Distributional assumptions of growth mixture models: Implications for over-extraction of latent trajectory classes. *Psychological Methods, 8,* 338–363.

Bauer, D., & Curran, P. J. (2004). The integration of continuous and discrete latent variable models: Potential problems and promising opportunities. *Psychological Methods, 9,* 3–29.

Bearman, P., & Brückner, H. (1999). *Power in numbers: Peer effects on adolescent girls' sexual debut and pregnancy.* Washington, DC: National Campaign to Prevent Teen Pregnancy.

Bearman, P., & Brückner, H. (2001). Promising the future: Virginity pledges and first intercourse. *American Journal of Sociology, 106*(4), 859–912.

Becker, H. S. (1961). Notes on the concept of commitment. *American Journal of Sociology, 66*(1), 32–40.

Becker, H. S. (1964). Personal change in adult life. *Sociometry, 27*(1), 40–53.

Bengtson, V. L., & Laufer, R. S. (1974). Youth, generations, and social change. *Journal of Social Issues, 30*(2/3, Pts. I & II).

Bergman, L. R., Magnusson, D., & El-Khouri, B. M. (2003). *Studying individual development in an interindividual context: A person-oriented approach* (Vol. 4). Mahwah, NJ: Erlbaum.

Blair-Loy, M. (2003). *Competing devotions: Career and family among women executives.* Cambridge, MA: Harvard University Press.

Block, J. (with N. Haan). (1971). *Lives through time.* Berkeley, CA: Bancroft.

Booth, A., Johnson, D. R., White, L. K., & Edwards, J. N. (1986). Divorce and marital instability over the life course. *Journal of Family Issues, 7*(4), 421–442.

Bouffard, L. A., & Laub, J. H. (2004). Jail or the army: Does military service facilitate desistance from crime. In R. Immarigeon & S. Maruna (Eds.), *After crime and punishment: Pathways to offender reintegration* (pp. 129–151). Devon, England: Willan.

Bound, J., Jaeger, D. A., & Baker, R. M. (1995). Problems with instrumental variables estimation when the correlation between the instruments and the endogenous explanatory variable is weak. *Journal of the American Statistical Association, 90*(430), 443–450.

Brehm, S. S., & Brehm, J. W. (1982). *Psychological reactance: A theory of freedom and control.* New York: Academic Press.

Brody, G. (Ed.). (1996). *Sibling relationships: Their causes and consequences* (Advances in Applied Developmental Psychology Series). Norwood, NJ: Ablex.

Brody, G. H., Ge, X., Kim, S. Y., Murry, V. M., Simons, R. L., Gibbons, F. X., et al. (2003). Neighborhood disadvantage moderates associations of parenting and older sibling problem attitudes and behavior with conduct disorders in African American children. *Journal of Consulting and Clinical Psychology, 71,* 211–222.

Bronfenbrenner, U. (1970). *Two worlds of childhood: US and USSR.* New York: Russell Sage.

Bronfenbrenner, U. (1979). *The ecology of human development: Experiments by nature and design.* Cambridge, MA: Harvard University Press.

Bronfenbrenner, U. (1989). Ecological systems theory. In R. Vasta (Ed.), *Six theories of child development: Revised formulations and current issues* (pp. 185–246). Greenwich, CT: JAI Press.

Bronfenbrenner, U. (1996). Foreword. In R. B. Cairns, G. H. Elder Jr., & E. J. Costello (Eds.), *Developmental science* (pp. ix-xvii). New York: Cambridge University Press.

Bronfenbrenner, U., & Ceci, S. J. (1994). Nature-nurture reconceptualized in developmental perspective: A bioecological model. *Psychological Review, 101*(4), 568–586.

Brooks-Gunn, J., & Duncan, G. J. (1997). The effects of poverty on children. *Future of Children, 7*(2), 55–71.

Buchmann, M. (1989). *The script of life in modern society: Entry into adulthood in a changing world.* Chicago: University of Chicago Press.

Bumpass, L., & Lu, H. H. (2000). Trends in cohabitation and implications for children's family contexts in the United States. *Population Studies: A Journal of Demography, 54*(1), 29–41.

Burton, L. M. (1985). *Early and on-time grandmotherhood in multigenerational Black families.* Unpublished doctoral dissertation, University of Southern California.

Burton, L. M., & Bengtson, V. L. (1985). Black grandmothers: Issues of timing and continuity of roles. In V. L. Bengtson & J. F. Robertson (Eds.), *Grandparenthood* (pp. 61–77). Beverly Hills: Sage.

Cairns, R. B., & Cairns, B. (1994). *Lifelines and risks: Pathways of youth in our time.* Cambridge, England: Cambridge University Press.

Cairns, R. B., Elder, G. H., Jr., & Costello, E. J. (1996). *Developmental science: Cambridge Studies in Social and Emotional Development.* New York: Cambridge University Press.

Cairns, R. B., McGuire, A. M., & Gariepy, J.-L. (1993). Developmental behavior genetics: Fusion, correlated constraints, and timing. In D. F. Hay & A. Angold (Eds.), *Precursors and causes in development and psychopathology* (pp. 87–122). New York: Wiley.

Caspi, A. (2004). Life-course development: The interplay of social selection and social causation within and across the generations. In P. L. Chase-Lansdale, K. Kiernan, & R. J. Friedman (Eds.), *Human development across lives and generations: The potential for change* (pp. 8–27). New York: Cambridge University Press.

Caspi, A., & Bem, D. J. (1990). Personality continuity and change across the life course. In L. A. Pervin (Ed.), *Handbook of personality: Theory and research* (pp. 549–575). New York: Guilford Press.

Caspi, A., Bem, D. J., & Elder, G. H., Jr. (1989). Continuities and consequences of interactional styles across the life course. *Journal of Personality, 57*(2), 375–406.

Caspi, A., Elder, G. H., Jr., & Bem, D. J. (1987). Moving against the world: Life course patterns of explosive children. *Developmental Psychology, 23*(2), 308–313.

Caspi, A., & Herbener, E. (1990). Continuity and change: Assortative marriage and the consistency of personality in adulthood. *Journal of Personality and Social Psychology, 58*(2), 250–258.

Caspi, A., Moffitt, T. E., Thornton, A., Freedman, D., Amell, J. W., Harrington, H., et al. (1996). The life history calendar: A research and clinical assessment method for collecting retrospective event-history data. *International Journal of Methods in Psychiatric Research, 6,* 101–114.

Caspi, A., & Sugden, K. (2003). Influence of life stress on depression: Moderation in the 5-HTT gene. *Science, 301,* 386–389.

Cherlin, A. J. (1993). *Marriage, divorce, and remarriage.* Cambridge, MA: Harvard University Press.

Clausen, J. A. (1968). *Socialization and society.* Boston: Little, Brown.

Clausen, J. A. (1993). *American lives: Looking back at the children of the great depression.* New York: Free Press.

Clausen, J. A. (1995). Gender, contexts and turning points in adults' lives. In P. Moen, G. H. Elder, Jr., & K. Lüscher (Eds.), *Examining Lives in Context: Perspectives on the geology of human development* (pp. 365–389). Washington, DC: American Psychological Association.

Clipp, E. C., & Elder, G. H., Jr. (1996). The aging veteran of World War II: Psychiatric and life course insights. In P. E. Ruskin & J. A. Talbott (Eds.), *Aging and post-traumatic stress disorder* (pp. 19–51). Washington, DC: American Psychiatric Press.

Coll, C. G., Bearer, E. L., & Lerner, R. M. (Eds.). (2004). *Nature and nurture: The complex interplay of genetic and environmental influences on human behavior and development.* Mahwah, NJ: Erlbaum.

Collins, L. M., & Sayer, A. G. (2001). *New methods for the analysis of change: Decade of behavior.* Washington, DC: American Psychological Association.

Cook, T. D., Herman, M., Phillips, M., & Settersten, R. A., Jr. (2002). Some ways in which neighborhoods, nuclear families, friendship groups and schools jointly affect changes in early adolescent development. *Child Development, 73,* 1283–1309.

Crosnoe, R., & Elder, G. H., Jr. (2004). From childhood to the later years: Pathways of human development. *Research on Aging, 26*(6), 623–654.

Crouter, A. C., & Booth, A. (2003). *Children's influence on family dynamics: The neglected side of family relationships.* Mahwah, NJ: Erlbaum.

Crouter, A. C., Maguire, M. C., Helms-Erikson, H., & McHale, S. N. (1999). Parental work in middle childhood: Links between em-

ployment and the division of housework, parent-child activities, and parental monitoring. In T. L. Parcel (Ed.), *Work and family: Research in the sociology of work series* (pp. 31–54). Greenwich, CT: JAI Press.

Dannefer, D. (1984). The role of the social in life-span developmental psychology, past and future: Rejoinder to Baltes and Nesselroade. *American Sociological Review, 49*(6), 847–850.

Dick, D. M., & Rose, R. J. (2001). Exploring gene-environment interactions: Socioregional moderation of alcohol use. *Journal of Abnormal Psychology, 110*(4), 625–632.

Dorn, L. D., Susman, E. J., & Ponirakis, A. (2003). Pubertal timing and adolescent adjustment and behavior: Conclusions vary by rater. *Journal of Youth and Adolescence, 32*(3), 157–167.

Drobnic, S., Blossfeld, H.-P., & Rohwer, G. (1999, February). Dynamics of women's employment patterns over the family life course: A comparison of the United States and Germany. *Journal of Marriage and the Family, 61,* 133–146.

Duncan, G. J., Brooks-Gunn, J., & Klebanov, P. K. (1994). Economic deprivation and early-childhood development. *Child Development, 65*(2), 296–318.

Duncan, G. J., Clark-Kauffman, E., & Snell, E. (in press). *Residential morbidity interventions as treatment for the sequelae of neighborhood violence [Mimeo].* Evanston, IL: Northwestern University, Institute for Poverty Research.

Duncan, T. E., Duncan, S. C., Strycker, L. A., Li, F., & Anthony, A. (1999). *An introduction to latent variable growth curve modeling: Concepts, issues, and applications—Quantitative methodology series.* Mahwah, NJ: Erlbaum.

Easterlin, R. A. (1980). *Birth and fortune: The impact of numbers on personal welfare.* New York: Basic Books.

Ebaugh, H. R. F. (1988). *Becoming an ex: The process of role exit.* Chicago: University of Chicago Press.

Eccles, J. S., & Midgley, C. (1989). Stage-environment fit: Developmentally appropriate classrooms for early adolescents. In R. E. Ames & C. Ames (Eds.), *Research on motivation in education* (Vol. 3, pp. 139–186). New York: Academic Press.

Eggleston, E. P., Laub, J. H., & Sampson, R. J. (2004). Methodological sensitivities to latent class analysis of long-term criminal trajectories. *Journal of Quantitative Criminology, 20*(1), 1–26.

Eichorn, D. H., Clausen, J. A., Haan, N., Honzik, M. P., & Mussen, P. H. (1981). *Present and past in middle life.* New York: Academic Press.

Eisenstadt, S. N. (1956). *From generation to generation: Age groups and social structure.* Glencoe, IL: Free Press.

Elder, G. H., Jr. (1975). Age differentiation and the life course. *Annual Review of Sociology, 1,* 165–190.

Elder, G. H., Jr. (1978). Family history and the life course. In T. K. Haraven (Ed.), *Transitions* (pp. 17–64). New York: Academic Press.

Elder, G. H., Jr. (1985). Perspectives on the life course. In G. H. Elder Jr. (Ed.), *Life course dynamics: Trajectories and transitions, 1968–1980*(pp. 23–49). Ithaca, NY: Cornell University Press.

Elder, G. H., Jr. (1986). Military times and turning points in men's lives. *Developmental Psychology, 22*(2), 233–245.

Elder, G. H., Jr. (1987). War mobilization and the life course: A cohort of World War II veterans. *Sociological Forum, 2*(3), 449–472.

Elder, G. H., Jr. (1991). Family transitions, cycles, and social change. In P. A. Cowan and M. Hetherington (Eds.), *Family Transitions* (pp. 31–57). Hillsdale, NJ: Erlbaum.

Elder, G. H., Jr. (1998a). The life course and human development. In W. Damon (Editor-in-Chief) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 939–991). New York: Wiley.

Elder, G. H., Jr. (1998b). The life course as developmental theory. *Child Development, 69*(1), 1–12.

Elder, G. H., Jr. (1999). *Children of the great depression: Social change in life experience.* Chicago: University of Chicago Press. (Original work published 1974)

Elder, G. H., Jr., & Caspi, A. (1988). Human development and social change: An emerging perspective on the life course. In N. Bolger, A. Caspi, G. Downey, & M. Moorehouse (Eds.), *Persons in context: Developmental processes* (pp. 77–113). New York: Cambridge University Press.

Elder, G. H., Jr., & Conger, R. D. (2000). Children of the land: Adversity and success in rural America. In *Studies on Successful Adolescent Development* (John D. and Catherine T. MacArthur Foundation Series on Mental Health and Development). Chicago: University of Chicago Press.

Elder, G. H., Jr., George, L. K., & Shanahan, M. J. (1996). Psychosocial stress over the life course. In H. B. Kaplan (Ed.), *Psychosocial stress: Perspectives on structure, theory, life course, and methods* (pp. 247–292). Orlando, FL: Academic Press.

Elder, G. H., Jr., Johnson, M. K., & Crosnoe, R. (2003). The emergence and development of the life course. In J. T. Mortimer & M. J. Shanahan (Eds.), *Handbook of the life course* (pp. 3–19). New York: Plenum Press.

Elder, G. H., Jr., & Meguro, Y. (1987). Wartime in men's lives: A Comparative Study of American and Japanese Cohorts. *International Journal of Behavioral Development, 10,* 439–466.

Elder, G. H., Jr., Modell, J., & Parke, R. D. (1993). *Children in time and place: Developmental and historical insights—Cambridge Studies in Social and Emotional Development.* New York: Cambridge University Press.

Elder, G. H., Jr., Pavalko, E. K., & Hastings, T. J. (1991). Talent, history, and the fulfillment of promise. *Psychiatry, 54,* 251–267.

Elder, G. H., Jr., & Pellerin, L. A. (April 1995). *Social development research in historical perspective, 1965–89: Is it more longitudinal and contextual today?* Poster session presented at the biennial meeting of the Society for Research in Child Development.

Elder, G. H., Jr., Shanahan, M. J., & Clipp, E. C. (1994). When war comes to men's lives: Life course patterns in family, work, and health [Special issue]. *Psychology and Aging, 9*(1), 5–16.

Ensel, M., & Lin, N. (2000). Age, the stress process, and physical distress: The role of distal stressors. *Journal of Aging and Health, 12,* 139–168.

Entwisle, D. R., Alexander, K. L., & Olson, L. S. (2003). The first-grade transition in life course perspective. In J. T. Mortimer & M. J. Shanahan (Eds.), *Handbook of the life course* (pp. 229–250). New York: Plenum Press.

Entwisle, D. R., Alexander, K. L., & Olson, L. S. (2005). First grade and educational attainment by age 22. *American Journal of Sociology, 110,* 1458–1502.

Erikson, E. H. (1950). *Childhood and society.* New York: Norton.

Erikson, E. H. (1963). *Childhood and society* (2nd ed.). New York: Norton.

Farrington, D. P., Loeber, R., Elliott, D. S., Hawkins, J. D., Kandel, D. B., Klein, M. W., et al. (1990). Advancing knowledge about the onset of delinquency and crime. In B. B. Lahey & A. E. Kazdin (Eds.), *Advances in clinical child psychology* (Vol. 13, pp. 283–342). New York: Plenum Press.

Farrington, D. P., & West, D. J. (1990). The Cambridge Study of Delinquent Development: A long-term follow-up of 411 London males. In H. J. Kerner & G. Kaiser (Eds.), *Kriminalitat: Personlichkeit, Lebensgeschichte und Verhalten* [Criminology: Personality, Behavior and Life History] (pp. 115–138). New York: Springer-Verlag.

Ferri, E., Bynner, J., & Wadsworth, M. (2002). *Changing Britain, changing lives: Three generations at the turn of the century* (Bedford Way Papers Series, No. 18). London: Institute of Education.

Fivush, R., & Haden, C. A. (Eds,) (2003). *Autobiographical memory and the construction of the narrated self: Developmental and cultural perspectives.* Mahwah, NJ: Erlbaum.

Ford, D. H., & Lerner, R. M. (1992). *Developmental systems theory: An integrative approach.* Newbury Park, CA: Sage.

Forest, K. B., Moen, P., & Dempster-McClain, D. (1995). Cohort differences in the transition to motherhood: The variable effects of education and employment before marriage. *Sociological Quarterly, 36*(2), 315–336.

Freedman, D., Thornton, A., Camburn, D., Alwin, D., & Young-DeMarco, L. (1988). The life history calendar: A technique for collecting retrospective data. *Sociological Methodology, 18,* 37–68.

Furstenberg, F. F., Jr., Brooks-Gunn, J., & Morgan, S. P. (1987). *Adolescent mothers in later life.* New York: Cambridge University Press.

Furstenberg, F. F., Jr., Cook, T. D., Eccles, J., Elder, G. H., Jr., & Sameroff, A. (1999). Managing to make it: Urban families and adolescent success. In *Studies on Successful Adolescent Development* (John D. and Catherine T. MacArthur Foundation Series on Mental Health and Development). Chicago: University of Chicago Press.

Fussell, E. (2002). Youth in aging societies. In J. T. Mortimer & R. W. Larsen (Eds.), *The changing adolescent experience: Societal trends and the transition to adulthood* (pp. 18–51). New York: Cambridge University Press.

Fussell, E., & Furstenberg, F. F., Jr. (2005). The transition to adulthood during the twentieth century: Race, nativity, and gender. In R. A. Settersten, Jr., F. F. Furstenberg, Jr., & R. G. Rumbaut (Eds.), *On the Frontier of Adulthood: Theory, Research, and Public Policy.* Chicago: University of Chicago Press.

Ge, X., Lorenz, F. O., Conger, R. D., Elder, G. H., Jr., & Simons, R. L. (1994). Trajectories of stressful life events and depressive symptoms during adolescence. *Developmental Psychology, 30*(4), 467–483.

George, L. K. (2003). Life course research: Achievements and potential. In J. T. Mortimer & M. J. Shanahan (Eds.), *Handbook of the life course* (pp. 671–680). New York: Plenum Press.

Gimbel, C., & Booth, A. (1996). Who fought in Vietnam? *Social Forces, 74*(4), 1137–1157.

Glaser, B. G., & Strauss, A. L. (1971). *Status passage.* Chicago: Aldine.

Glueck, S., & Glueck, E. (1968). *Delinquents and nondelinquents in perspective.* Cambridge, MA: Harvard University Press.

Goldthorpe, J. H. (1991). The uses of history in sociology: Reflections on some recent tendencies. *British Journal of Sociology, 42*(2), 211–230.

Goode, W. J. (1960). The theory of role strain, *American Sociological Review, 25*(4), 483–496.

Guo, G., Brooks-Gunn, J., & Harris, K. M. (1996). Parental labor-force attachment and grade retention among urban Black children. *Sociology of Education, 69,* 217–236.

Guo, G., & Stearns, E. (2002). The social influences on the realization of genetic potential for intellectual development. *Social Forces, 80,* 881–910.

Hagan, J. (2001). *Northern passage: American Vietnam War resisters in Canada.* Cambridge, MA: Harvard University Press.

Haidt, J., & Rodin, J. (1999). Control and efficacy as interdisciplinary bridges. *Review of General Psychology, 3*(4), 317–337.

Halfon, N., & Hochstein, M. (2002). Life course health development: An integrated framework for developing health, policy, and research. *Milbank Quarterly, 80*(3), 433–479.

Hareven, T. K. (1978). *Transitions: The family and the life course in historical perspective.* New York: Academic Press.

Hareven, T. K. (1982). *Family time and industrial time.* New York: Cambridge University Press.

Hartup, W. W., & Laursen, B. (1991). Relationships as developmental contexts. In R. Cohen & A. Siegel (Eds.), *Context and development* (pp. 253–279). Hillsdale, NJ: Erlbaum.

Hasin, D., Aharonovich, E., Liu, X., Mamman, Z., Matseoane, K., Carr, L., et al. (2002). Alcohol and ADH2 in Israel: Ashkenazis, Sephardic, and recent Russian immigrants. *American Journal of Psychiatry, 159,* 1432–1434.

Havighurst, R. J. (1949). *Developmental tasks and education.* Chicago: University of Chicago Press.

Havighurst, R. J., Baughman, J. W., Burgess, E. W., & Eaton, W. H. (1951). *The American veteran back home.* New York: Longmans, Green.

Hayward, M. D., & Gorman, B. K. (2004). The long arm of childhood: The influence of early-life social conditions on men's mortality. *Demography, 41*(1), 87–107.

Heath, A. C., Todorov, A. A., Nelson, E. C., Madden, P. A. F., Bucholz, K. K., & Martin, N. G. (2002). Gene-environment interaction effects on behavioral variation and risk of complex disorders: The example of alcoholism and other psychiatric disorders. *Twin Research, 5,* 30–37.

Heckhausen, J. (1999). *Developmental regulation in adulthood: Age-normative and sociostructural constraints as adaptive challenges.* New York: Cambridge University Press.

Hernandez, D. J. (1993). *America's children: Resources from family, government, and the economy—The Population of the United States in the 1980s.* New York: Russell Sage.

Hertzman, C., & Power, C. (2003). Health and human development: Understandings from life-course research. *Developmental Neuropsychology, 24*(2/3), 719–744.

Hetherington, E. M. (Ed.). (1999). *Coping with divorce, single parenting, and remarriage: A risk and resiliency perspective.* Mahwah, NJ: Erlbaum.

Higuchi, S., Matsushita, S., Imazeki, H., Kinoshita, T., Takagi, S., & Kono, H. (1994). Aldehyde dehydrogenase genotypes in Japanese alcoholics. *Lancet, 343,* 741–742.

Hill, R. (1970). *Family development in three generations.* Cambridge, MA: Schenkman Books.

Hitlin, S., & Elder, G. H., Jr. (in press). Agency: An empirical model of an abstract concept. In R. MacMillan (Ed.), *Advances in life course research.* Greenwich, CT: JAI Press.

Hofer, S. M., & Sliwinski, M. J. (2002). Understanding ageing: An evaluation of research designs for assessing the interdependence of ageing-related changes. *Gerontology, 47,* 341–352.

Hofferth, S. L. (1987). Teenage pregnancy and its resolution. In S. L. Hofferth & C. Hayes (Eds.), *Risking the future: Adolescent sexual-*

ity, pregnancy, and childbearing (Vol. 2, pp. 78–92). Washington, DC: National Academy Press.

Hoffman, J. P., & Cerbone, F. G. (1999). Stressful life-events and delinquency escalation in early adolescence. *Criminology, 37,* 343–373.

Hogan, D. P. (1981). *Transitions and social change: The early lives of American man.* New York: Academic.

Holahan, C. K., & Sears, R. R. (1995). *The gifted group in later maturity.* Stanford, CA: Stanford University Press.

Hughes, E. (1971). *The sociological eye: Selected papers on work, self, and the study of society* (Vol. 1). Chicago: Aldine-Atherton.

Jackson, J. S. (Ed.). (2000). *New directions: African Americans in a diversifying nation.* Washington, DC: National Policy Association.

Jarjoura, G. R., Triplett, R. A., & Brinker, G. P. (2002). Growing up poor: Examining the link between persistent childhood poverty and delinquency. *Journal of Quantitative Criminology, 18*(2), 159–187.

Johnston, T. D., & Edwards, L. (2002). Genes, interactions, and the development of behavior. *Psychological Review, 109,* 26–34.

Jones, M. C., Bayley, N., Macfarlane, J. W., & Honzik, M. E. (1971). *The course of human development: Selected Papers from the Longitudinal Studies, University of California, Berkeley, Institute of Human Development.* Waltham, MA: Xerox College Publishing.

Kagan, J., & Moss, H. A. (1962). *Birth to maturity: A Study in Psychological Development.* New York: Wiley.

Katz, L. F., Kling, J., & Liebman, J. (2001). Moving to opportunity in Boston: Early impacts of a housing mobility program. *Quarterly Journal of Economics, 116*(2), 607–654.

Kaufman, J. S., Kaufman, S., & Poole, C. (2003). Causal Inference from randomized trials in social epidemiology. *Social Science Medicine, 57*(12), 2397–2409.

Kendler, K. S., & Eaves, L. (1986). Models for the joint effect of genotype and environment on liability to psychiatric illness. *American Journal of Psychiatry, 143,* 279–289.

Kendler, K. S., Gardner, C. O., & Prescott, C. A. (2002). Toward a comprehensive developmental model for major depression in women. *American Journal of Psychiatry, 159,* 1133–1145.

Kendler, K. S., & Kessler, R. C. (1995). Stressful life events, genetic liability, and onset of an episode of major depression in women. *American Journal of Psychiatry, 152*(6), 833–842.

Kerckhoff, A. C. (1993). *Diverging pathways: Social structure and career deflections.* New York: Cambridge University Press.

Kerckhoff, A. C. (2003). From student to worker. In J. T. Mortimer & M. J. Shanahan (Eds.), *Handbook of the life course* (pp. 251–267). New York: Plenum Press.

Kertzer, D. I., & Keith, J. (1984). *Age and anthropological theory.* Ithaca, NY: Cornell University Press.

Kim, K. J., Conger, R. D., Elder, G. H., Jr., & Lorenz, F. O. (2003). Reciprocal influences between stressful life-events and adolescent internalizing and externalizing problems. *Child Development, 74,* 127–143.

Kling, J. R., & Liebman, J. B. (2004). Experimental analysis of neighborhood effects on youth. *Princeton IRS Working Paper, No. 483.*

Koopmans, J. R., & Slutske, W. S. (1999). The influence of religion on alcohol use initiation: Evidence for genotype x environment interaction. *Behavior Genetics, 29*(6), 445–453.

Krein, S. F., & Beller, A. H. (1988). Educational attainment of children from single-parent families: Differences by exposure, gender, and race. *Demography, 25*(2), 221–234.

Kuh, D., Ben-Shlomo, Y., Lynch, J., Hallqvist, J., & Power, C. (2003). Life course epidemiology. *Journal of Epidemiology and Community Health, 57*(10), 778–783.

Kuh, D., Power, C., Blane, D., & Bartley, M. (1997). Social pathways between childhood and adult health. In D. Kuh & Y. Ben-Shlomo (Eds.), *A life course approach to chronic disease epidemiology* (pp. 169–198). New York: Oxford University Press.

Laub, J. H., & Sampson, R. J. (2003). *Shared beginnings, divergent lives.* Cambridge, MA: Harvard University Press.

Leadbeater, B. J., Kuperminc, G. P., Blatt, S. J., & Hertzog, C. (1999). A multivariate model of gender differences in adolescents' internalizing and externalizing problems. *Developmental Psychology, 35,* 1268–1282.

Leisering, L. (2003). Government and the life course. In J. T. Mortimer & M. J. Shanahan (Eds.), *Handbook of the life course* (pp. 205–225). New York: Plenum Press.

Lerner, R. M. (1982). Children and adolescents as producers of their own development. *Developmental Review, 2*(4), 342–370.

Lerner, R. M. (1984). *On the nature of human plasticity.* Cambridge: Cambridge University Press.

Lerner, R. M. (1991). Changing organism-context relations as the basic process of development: A developmental contextual perspective. *Developmental Psychology, 27*(1), 27–32.

Levinson, D. J. (1978). *The seasons of a man's life.* New York: Knopf.

Lewin, K. (1948). *Resolving social conflicts: Selected papers on group dynamics.* New York: Harper.

Link, B. G., & Phelan, J. (1995). Social conditions as fundamental causes of disease [Special issue: Forty years of medical sociology: The state of the art and directions for the future]. *Journal of Health and Social Behavior, 35,* 80–94.

Little, T. D., Bovaird, J., & Marquis, J. (in press). *Modeling developmental processes in context.* Mahwah, NJ: Erlbaum.

Little, T. D., Schnabel, K. U., & Baumert, J. (2000). *Modeling longitudinal and multilevel data: Practical issues, applied approaches, and specific examples.* Mahwah, NJ: Erlbaum.

Ludwig, J., Duncan, G. J., & Hirschfield, P. (2001). Urban poverty and juvenile crime: Evidence from a randomized housing-mobility experiment. *Quarterly Journal of Economics, 116*(2), 655–680.

Luthar, S. S. (2003). *Resilience and vulnerability: Adaptation in the context of childhood adversities.* New York: Cambridge University Press.

Lynd, R. S., & Lynd, H. M. (1929). *Middletown.* New York: Harcourt, Brace and Company.

Lynd, R. S., & Lynd, H. M. (1937). *Middletown in transition: A Study in Cultural Conflicts.* New York: Harcourt, Brace and Company.

Macmillan, R., Hitlin, S., & Elder, H. E., Jr. (in press). *Constructing adulthood: Agency and subjectivity in the life course—Advances in life course research* (Vol. 10). New York: Elsevier/JAI Press.

Mare, R. D. (1990). Socio-economic careers and differential mortality among older men in the United States. In J. Vallin, S. D'Souza, & A. Palloni (Eds.), *Comparative Studies of Mortality and Morbidity: Old and new approaches to measurement and analysis.* London: Oxford University Press.

Marini, M. M. (1984). Age and sequencing norms in the transition to adulthood. *Social Forces, 63,* 229–244.

Marshall, V. W., Heinz, W. R., Kruger, H., & Verma, A. (2001). *Restructuring work and the life course.* Toronto, Ontario, Canada: University of Toronto Press.

Marsiske, M., Lang, F. R., Baltes, P. B., & Baltes, M. M. (1995). Selective optimization with compensation: Life-span perspectives

on successful human development. In R. A. Dixon & L. Bäckman (Eds.), *Compensation for psychological deficits and declines: Managing losses and promoting gains* (pp. 35–79). Mahwah, NJ: Erlbaum.

Maruna, S. (2001). *Making good: How ex-convicts reform and rebuild their lives.* Washington, DC: American Psychological Association.

Mattick, H. W. (1960). Parolees in the army during World War II. *Federal Probation, 24,* 49–55.

Mayer, K. U. (1986). Structural constraints on the life course. *Human Development, 29*(3), 163–170.

Mayer, K. U. (1988). German survivors of World War II: The impact on the life course of the collective experience of birth cohorts. In M. W. Riley (Ed., with B. J. Huber & B. B. Hess) *Social change and the life course: Vol. I. Social structures and human lives* (pp. 229–246). Newbury Park, CA: Sage.

Mayer, K. U. (2003). The sociology of the life course and lifespan psychology: Diverging or converging pathways. In U. M. Staudinger and U. Lindberger (Eds.), *Understanding human development: Dialogues with lifespan psychology* (pp. 463–481). Boston: Kluwer.

Mayer, K. U. (2004). Whose lives? How history, societies, and institutions define and shape life courses. *Research in Human Development, 1*(3), 161–187.

Mayer, K. U., & Huinink, J. (1990). Age, period, and cohort in the Study of the Life Course: A comparison of classical A-P-C analysis with event history analysis or farewell to lexis. In D. Magnusson & L. R. Bergman (Eds.), *Data quality in longitudinal research* (pp. 211–232). New York: Cambridge University Press.

McClearn, G. E., Vogler, G. M., & Hofer, S. M. (2001). Gene-gene and gene-environment interactions. In *Handbook of the biology of aging* (pp. 423–444). San Diego, CA: Academic Press.

McDonough, P., Duncan, G. J., Williams, D., & House, J. (1997). Income dynamics and adult mortality in the United States, 1972–1989. *American Journal of Public Health, 87*(9), 1476–1483.

McGue, M. (1999). The behavioral genetics of alcoholism. *Current Directions in Psychological Science, 8*(4), 109–115.

McGue, M., & Bouchard, T. J. (1998). Genetic and environmental influences on human behavioral differences. *Annual Review of Neuroscience, 21,* 1–24.

McLanahan, S. S., & Sandefur, G. (1994). *Growing up with a single parent: What hurts, what helps.* Cambridge, MA: Harvard University Press.

McLanahan, S. S., & Sorensen, A. B. (1985). Life events and psychological well-being over the life course. In G. H. Elder Jr. (Ed.), *Life course dynamics: Trajectories and transitions, 1968–1980* (pp. 217–238). Ithaca, NY: Cornell University Press.

McLeod, J. D., & Almazan, E. P. (2003). Connections between childhood and adulthood. In J. T. Mortimer & M. J. Shanahan (Eds.), *Handbook of the life course* (pp. 391–411). New York: Plenum Press.

Mead, G. H. (1934). *Mind, self, and society.* Chicago: University of Chicago Press.

Merton, R. K. (1968). *Social theory and social structure.* New York: Free Press.

Merton, R. K. (1982). *Socially expected durations.* Paper presented at the annual meeting of the American Sociological Association, San Francisco.

Merton, R. K. (1984). Socially expected durations: A case study of concept formation in sociology. In W. W. Powell & Richard Robbins (Eds.), *Conflict and consensus: A festschrift for Lewis A. Coser.* New York: The Free Press.

Mills, C. W. (1959). *The sociological imagination.* New York: Oxford University Press.

Mitterauer, M. (1993). *A history of youth.* Oxford, England: Blackwell.

Modell, J. (1989). *Into one's own: From youth to adulthood in the United States 1920–1975.* Berkeley, CA: University of California Press.

Moen, P. (2003). *It's about time: Couples and careers.* Ithaca, NY: Cornell University Press.

Moen, P., Elder, G. H., Jr., & Lüscher, K. (Eds.). (1995). *Examining lives in context: Perspectives on the ecology of human development—Essays in honor of Urie Bronfenbrenner.* Washington, DC: American Psychological Association.

Moffitt, T. E. (1993). Adolescence-limited and life-course-persistent antisocial behavior: A developmental taxonomy. *Psychological Review, 100*(4), 674–701.

Moffitt, T. E., Caspi, A., Dickson, N., Silva, P., & Stanton, W. (1996). Childhood-onset versus adolescent-onset antisocial conduct problems in males: Natural history from age 3 to 18. *Development and Psychopathology, 8,* 399–424.

Moffitt, T. E., Caspi, A., Harrington, H., & Milne, B. J. (2002). Males on the life-course-persistent and adolescence-limited antisocial pathways: Follow-up at age 26 years. *Development and Psychopathology, 14*(1), 179–207.

Molenaar, P. C. M., Huizenga, H. M., & Nesselroade, J. R. (in press). The relationship between the structure of intra-individual and inter-individual variability: A theoretical and empirical vindication of developmental systems theory. In U. M. Staudinger & U. Lindenberger (Eds.), *Understanding human development.* Boston: Kluwer Press.

Morenoff, J. D. (2003). Neighborhood mechanisms and the spatial dynamics of birth weight. *American Journal of Sociology, 108,* 976–1017.

Mortimer, J. T. (2003). *Working and growing up in America.* Cambridge, MA: Harvard University Press.

Mortimer, J. T., & Shanahan, M. J. (2003). *Handbook on the life course.* New York: Plenum Press.

Mortimer, J. T., Staff, J., & Oesterle, S. (2003). Adolescent work and the early socioeconomic career. In J. T. Mortimer & M. J. Shanahan (Eds.), *Handbook of the life course.* New York: Plenum Press.

Nagin, D. S. (1999). Analyzing developmental trajectories: A semiparametric group-based approach. *Psychological Methods, 4*(2), 139–157.

Nagin, D. S. (2004). Response to "methodological sensitivities to latent class analysis of long-term criminal trajectories." *Journal of Quantitative Criminology, 20*(1), 27–35.

Nagin, D. S., Farrington, D. P., & Moffitt, T. E. (1995). Life-course trajectories of different types of offenders. *Criminology, 33*(1), 111–139.

Nagin, D. S., & Land, K. C. (1993). Age, criminal careers and population heterogeneity: Specification and estimation of a nonparametric, mixed poisson model. *Criminology, 31,* 327–362.

Nagin, D. S., & Paternoster, R. (2000). Population heterogeneity and state dependence: State of the evidence and directions for future research. *Journal of Quantitative Criminology, 16*(2), 117–144.

Nagin, D. S., & Tremblay, R. E. (2001). Analyzing developmental trajectories of distinct but related behaviors: A group-based method. *Psychological Methods, 6*(1), 18–34.

Neugarten, B. L. (1968). *Middle age and aging: A reader in social psychology.* Chicago: University of Chicago Press.

Neugarten, B. L. (Ed.) (with a foreword by D. A. Neugarten). (1996). *The meanings of age: Selected papers of Bernice L. Neugarten.* Chicago: University of Chicago Press.

Neugarten, B. L., & Datan, N. (1973). Sociological perspectives on the life cycle. In P. B. Baltes & K. W. Schaie (Eds.), *Life-span developmental psychology: Personality and socialization* (pp. 53–69). New York: Academic Press.

Neugarten, B. L., Moore, J. W., & Lowe, J. C. (1965). Age norms, age constraints, and adult socialization. *American Journal of Sociology, 70*(6), 710–717.

Neugarten, B. L., & Peterson, W. A. (1957). A Study of the American Age-Grade System. *Proceedings from the Fourth Congress of the International Association of Gerontology, 3,* 497–502.

Nisbet, R. (1969). *Social change and history.* New York: Oxford University Press.

Noack, P., Hofer, M., & Youniss, J. (1995). *Psychological responses to social change: Human development in changing environments.* New York: Walter de Gruyter.

Oh, H. J. (2001, February). An exploration of the influence of household poverty spells on mortality risk. *Journal of Marriage and Family, 63,* 224–234.

O'Rand, A. M., & Krecker, M. L. (1990). Concepts of the life cycle: Their history, meanings and uses in the social sciences. *Annual Review of Sociology, 16,* 241–262.

Pallas, A. M. (2003). Educational transitions, trajectories, and pathways. In J. T. Mortimer & M. J. Shanahan (Eds.), *Handbook of the life course* (pp. 165–184). New York: Plenum Press.

Pampel, F. C., & Peters, H. E. (1995). The Easterlin effect. *Annual Review of Sociology, 21,* 163–194.

Parke, R. D., & Ladd, G. W. (1992). *Family-peer relationship: Modes of linkage.* Hillsdale, NJ: Erlbaum.

Parke, R. D., Ornstein, P. A., Rieser, J. J., & Zahn-Waxler, C. (1994). *A century of developmental psychology.* Washington, DC: American Psychological Association.

Paternoster, R., Bushway, S., Brame, R., & Apel, R. (2003). The effect of teenage employment on delinquency and problem behaviors. *Social Forces, 82*(1), 297–335.

Patterson, G. R. (1996). Some characteristics of a developmental theory of early-onset delinquency. In M. F. Lenzenweger & J. J. Haugaard (Eds.), *Frontiers of developmental psychopathology* (pp. 81–124). New York: Oxford University Press.

Patterson, G. R., & Yoerger, K. (1996). A developmental model for late-onset delinquency. In D. W. Osgood (Ed.), *Nebraska Symposium on Motivation: Motivation and delinquency* (pp. 119–177). Lincoln: University of Nebraska Press.

Pepler, D. J., & Rubin, K. H. (1991). *The development and treatment of childhood aggression.* Hillsdale, NJ: Erlbaum.

Phelps, E., Furstenberg, F. F., Jr., & Colby, A. (2002). *Looking at lives: American Longitudinal Studies of the Twentieth Century.* New York: Russell Sage Foundation.

Pinquart, M., & Silbereisen, R. K. (2004). Human development in times of social change: Theoretical considerations and research needs. *International Journal of Behavioral Development, 28*(4), 289–298.

Poulton, R., Caspi, A., Milne, B. J., Thomson, W. M., Taylor, A., & Sears, M. R. (2002). Association between children's experience of socioeconomic disadvantage and adult health: A Life-Course Study. *Lancet, 360,* 1640–1645.

Power, C., & Hertzman, C. (1997). Social and biological pathways linking early life and adult disease. *British Medical Bulletin, 53*(1), 210–221.

Power, C., Manor, O., & Matthews, S. (1999). The duration and timing of exposure: Effects of socioeconomic environment on adult health. *American Journal of Public Health, 89*(7), 1059–1065.

Quinton, D., Pickles, A., Maughan, B., & Rutter, M. (1993). Partners, peers, and pathways: Assortative pairing and continuities in conduct disorder. *Development and Psychopathology, 5*(4), 763–783.

Quinton, D., & Rutter, M. (1988). *Parenting breakdown: The making and breaking of intergenerational links.* Aldershot, England: Avebury.

Rabinowitz, L. S., & Rosenbaum, J. E. (2000). *Crossing the class and color lines: From public housing to White suburbia.* Chicago: University of Chicago Press.

Rachman, S. (1979). The concept of required helpfulness. *Behavior Research and Therapy, 17*(1), 1–6.

Rampon, C., Tang, Y.-P., Goodhouse, J., Shimuzu, M., Kyin, M., & Tsien, J. M. (2000). Enrichment induces structural changes and recovery from nonspatial memory deficits in CA1 NMDAR1-knockout mice. *Nature Neuroscience, 3*(3), 238–244.

Rampon, C., & Tsien, J. Z. (2000). Genetic analysis of learning behavior-induced structural plasticity. *Hippocampus, 10,* 605–609.

Rank, M. R., & Hirschl, T. A. (1999). The economic risk of childhood in America: Estimating the probability of poverty across the formative years. *Journal of Marriage and the Family, 61*(4), 1058–1067.

Riley, M. W., Johnson, M. E., & Foner, A. (1972). *Aging and society.* New York: Russell Sage.

Robins, L. (1966). *Deviant children grown up.* Baltimore: Williams & Wilkins.

Rodgers, W. L., & Thornton, A. (1985). Changing patterns of first marriage in the United States. *Demography, 22*(2), 265–279.

Rosenberg, M. (1979). *Conceiving the self.* New York: Basic Books.

Rowe, D. C. (2001). Assessing genotype-environment interactions and correlations in the postgenomic era. In R. Plomin, J. C. DeFries, G. E. McClearn, & P. McGuffin (Eds.), *Behavioral genetics* (4th ed., pp. 71–86). New York: Worth.

Rowe, D. C., & Jacobson, K. C. (1999). Genetic and environmental influences on vocabulary IQ: Parental education level as moderator. *Child Development, 70*(5), 1151–1162.

Rutter, M. (1989). Pathways from childhood to adult life. *Journal of Child Psychology and Psychiatry, 30*(1), 23–51.

Rutter, M. (1990). Psychosocial resilience and protective mechanisms. In J. E. Rolf, A. S. Masten, D. Cicchetti, K. H. Neuchterlein, & S. Weintraub (Eds.), *Risk and protective factors in the development of psychopathology* (pp. 181–214). New York: Cambridge.

Rutter, M., & Madge, N. (1976). *Cycles of disadvantage: A review of research.* London: Heinemann.

Rutter, M., & Pickles, A. (1991). Person-environment interactions: Concepts, mechanisms, and implications for data analysis. In T. E. Wachs & R. Plomin (Eds.), *Conceptualization and measurement of organism-environment interaction* (pp. 105–141). Washington, DC: American Psychological Association.

Rutter, M., & Silberg, J. (2002). Gene-environment interplay in relation to emotional and behavioral disturbance. *Annual Review of Psychology, 53,* 463–490.

Ryder, N. B. (1965). The cohort as a concept in the Study of Social Change. *American Sociological Review, 30*(6), 843–861.

Ryu, S., & Mortimer, J. T. (1996). The "occupational linkage hypothesis" applied to occupational value formation in adolescence. In J. T. Mortimer & M. D. Finch (Eds.), *Adolescents, work, and family: An intergenerational developmental analysis* (pp. 167–190). Thousand Oaks, CA: Sage.

Sampson, R. J., & Laub, J. H. (1993). *Crime in the making: Pathways and turning points through life.* Cambridge, MA: Harvard University Press.

Sampson, R. J., & Laub, J. H. (1996). Socioeconomic achievement in the life course of disadvantaged men: Military service as a turning point, circa 1940–1965. *American Sociological Review, 61*(3), 347–367.

Sampson, R. J., & Laub, J. H. (1997). A life-course theory of cumulative disadvantage and the stability of delinquency. In T. P. Thornberry (Ed.), *Developmental theories of crime and delinquency: Advances in criminological theory* (Vol. 7, pp. 133–161). New Brunswick, NJ: Transaction.

Sampson, R. J., Morenoff, J. D., & Gannon-Rowley, T. (2002). Assessing "neighborhood effects": Social processes and new directions in research. *Annual Review of Sociology, 28,* 443–478.

Sawa, A., & Snyder, S. H. (2002). Schizophrenia: Diverse approaches to a complex disease. *Science, 296,* 692–695.

Schaie, K. W. (1965). A general model for the Study of Developmental Problems. *Psychological Bulletin, 64*(2), 92–107.

Schiller, K. S. (1999, October). Effects of feeder patterns on students' transition to high school. *Sociology of Education, 72,* 216–233.

Schoenhals, M., Tienda, M., & Schneider, B. (1998). The educational and personal consequences of adolescent employment. *Social Forces, 77*(2), 723–761.

Schoon, I., Bynner, J., Joshi, H., Parsons, S., Wiggins, R. W., & Sacker, A. (2002). The influence of context, timing, and duration of risk experiences for the passage from childhood to midadulthood. *Child Development, 73*(5), 1486–1504.

Settersten, R. A., Jr., Furstenberg, F. F., Jr., & Rumbaut, R. (2005). *On the frontier of adulthood: Theory, research and public policy.* Chicago: University of Chicago Press.

Settersten, R. A., Jr., & Mayer, K. U. (1997). The Measurement of Age, Age Structuring, and the Life Course. *Annual Review of Sociology, 23,* 233–261.

Shanahan, M. J., & Bauer, D. (2005). Developmental properties of transactional models: The case of life-events and mastery from adolescence to young adulthood. *Development and Psychopathology, 16,* 1095–1117.

Shanahan, M. J., & Elder, G. H., Jr. (2002). History, agency, and the life course. In L. J. Crockett (Ed.), *Agency, motivation, and the life course* (pp. 145–185). Lincoln: University of Nebraska Press.

Shanahan, M. J., Elder, G. H., Jr., & Miech, R. A. (1997). History and agency in men's lives: Pathways to achievement in cohort perspective. *Sociology of Education, 70*(1), 54–67.

Shanahan, M. J., & Hofer, S. M. (2005). Social context in gene-environment interactions: Retrospect and prospect [Special issue on the future of behavioral genetics and aging]. *Journal of Gerontology: Social, 60B* 65–76.

Shanahan, M. J., Hofer, S. M., & Shanahan, L. (2003). Biological models of behavior and the life course. In J. T. Mortimer & M. J. Shanahan (Eds.), *Handbook of the life course* (pp. 597–622). New York: Plenum Press.

Shanahan, M. J., Mortimer, J. T., & Kruger, H. (2002). Adolescence and adult work in the twenty-first century. *Journal of Research in Adolescence, 12,* 99–120.

Shanahan, M. J., & Porfeli, E. (2002). Integrating the life course and life-span: Formulating research questions with dual points of entry. *Journal of Vocational Behavior, 61,* 398–406.

Shanahan, M. J., Sulloway, F. J., & Hofer, S. M. (2000). Conceptual models of context in developmental studies. *International Journal of Behavioral Development, 24,* 421–427.

Silbereisen, R. K., & Schmitt-Rodermund, E. (1995). German immigrants in Germany: Adaptation of adolescents' timetables for autonomy. In P. Noack, M. Hofer, & J. Youniss (Eds.), *Psychological responses to social change: Human development in changing environments* (pp. 105–125). Berlin, Germany: Walter de Gruyter.

Silbereisen, R. K., & Wiesner, M. (2000). Cohort change in adolescent developmental timetables after German unification: Trends and possible reasons. In J. Heckhausen (Ed.), *Motivational psychology of human development: Developing motivation and motivating development* (pp. 271–284). Amsterdam: Elsevier.

Silbereisen, R. K., & Wiesner, M. (2002). Lessons from research on the consequences of German unification: Continuity and discontinuity of self-efficacy and the timing of psychosocial transitions. *Applied Psychology: An International Review, 51,* 290–316.

Silberg, J., & Rutter, M. (2001). Genetic moderation of environmental risk for depression and anxiety in adolescent girls. *British Journal of Statistical Psychiatry, 179,* 116–121.

Simmons, R. G., Burgeson, R., Carlton-Ford, S., & Blyth, D. A. (1987). The impact of cumulative change in early adolescence. *Child Development, 58*(5), 1220–1234.

Singer, B. H., & Ryff, C. D. (2001). *New horizons in health: An integrative approach.* Washington, DC: National Academy Press.

Singer, J. D., & Willett, J. B. (2003). *Applied longitudinal data analysis: Modeling change and event occurrence.* New York: Oxford University Press.

Sofer, C. (1970). *Men in mid-career: A Study of British Managers and Technical Specialists.* Cambridge, England: Cambridge University Press.

Spilerman, S. (1977). Careers, labor market structure, and socioeconomic achievement. *American Journal of Sociology, 83*(3), 551–593.

Staudinger, U. M. (1989). *The Study of Life Review: An approach to the investigation of intellectual development across the life-span.* Berlin, Germany: Max-Planck-Institut.

Stevens, A. H. (1999). Measuring the persistence of poverty over multiple spells: Climbing out of poverty, falling back. *Journal of Human Resources, 34*(3), 557–588.

Stolz, L. M. (1954). *Father relations of war-born children.* Stanford, CT: Stanford University Press.

Stouffer, S. A., Lumsdaine, A. A., Lumsdaine, M. H., Williams, R. M., Jr., Smith, M. B., Janis, I. L., et al. (1949). *The American soldier: Studies in Social Psychology in World War II.* Princeton, NJ: Princeton University Press.

Sweeney, M. M., & Horwitz, A. V. (2001). Infidelity, initiation, and the emotional climate of divorce: Are there implications for mental health? *Journal of Health and Social Behavior, 42,* 295–309.

Thoits, P. A. (1994). Stressors and problem-solving: The individual as psychological activist. *Journal of Health and Social Behavior, 35*(2), 143–160.

Thomas, W. I., & Znaniecki, F. (1918–1920). *The Polish peasant in Europe and America* (Vols. 1–2). Boston: Badger.

Tremblay, R. E. (2004). The development of human physical aggression: How important is early childhood. In L. A. Leavitt & D. M. B. Hall (Eds.), *Social and moral development: Emerging evidence on the toddler years* (pp. 221–238). New Brunswick, NJ: Johnson and Johnson Pediatric Institute.

Turner, R. J., & Lloyd, D. A. (1995). Lifetime traumas and mental health: The significance of cumulative adversity. *Journal of Health and Social Behavior, 36,* 360–376.

Turner, R. J., Wheaton, B., & Lloyd, D. A. (1995). The epidemiology of social stress. *American Sociological Review, 60,* 104–125.

Uhlenberg, P. (1974). Cohort variations in family life-cycle experiences of US women. *Journal of Marriage and Family, 36,* 282–294.

Vaillant, G. E. (1977). *Adaptation to life.* Boston: Little, Brown.

van de Mheen, H., Stronks, K., Looman, C. W., & Mackenbach, J. P. (1998). Does childhood socioeconomic status influence adult health through behavioral factors? *International Journal of Epidemiology, 27*(3), 431–437.

van der Lippe, T., & van Dijk, L. (2002). Comparative research on women's employment. *Annual Review of Sociology, 28,* 221–241.

van Os, J., & Marcelis, M. (1998). The ecogenetics of schizophrenia: A review. *Schizophrenia Research, 32,* 127–135.

VanLaningham, J., Johnson, D. R., & Amato, P. (2001). Marital happiness, marital duration, and the u-shaped curve: Evidence from a Five-Wave Panel Study. *Social Forces, 78*(4), 1313–1341.

Volkart, E. H. (1951). *Social behavior and personality: Contributions of W. I. Thomas to theory and social research.* New York: Social Science Research Council.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes.* Cambridge, MA: Harvard University Press.

Wadsworth, M. E. J., Montgomery, S. M., & Bartley, M. J. (1999). The persisting effect of unemployment on health and social well-being in men early in working life. *Social Science and Medicine, 48,* 1491–1499.

Wahlsten, D. (1999). Single-gene influences on brain and behavior. *Annual Review of Psychology, 50,* 599–624.

Warren, J. R., LePore, P. C., & Mare, R. D. (2000). Employment during high school: Consequences for students' grades in academic courses. *American Educational Research Journal, 37*(4), 943–969.

Werner, E. E., & Smith, R. S. (2001). *Journeys from childhood to midlife: Risk, resilience, and recovery.* New York: Cornell University Press.

Wheaton, B. (1990). Life transitions, role histories, and mental health. *American Sociological Review, 55*(2), 209–223.

Wheaton, B., & Clarke, P. (2003). Space meets time: Integrating temporal and contextual influences on mental health in early adulthood. *American Sociological Review, 68,* 680–706.

White, L. K., & Booth, A. (1991). Divorce over the life course: The role of marital happiness. *Journal of Family Issues, 12*(1), 5–21.

Wilensky, H. L. (1960). Work, career, and social integration. *International Social Science Journal, 12*(4), 543–560.

Willitts, M., Benzeval, M., & Stansfeld, S. (2004). Partnership history and mental health over time. *Journal of Epidemiology and Community Health, 58*(1), 53–58.

Wortman, C. B., & Silver, R. C. (1990). Successful mastery of bereavement and widowhood: A life-course perspective. In P. B. Baltes & M. M. Baltes (Eds.), *Successful aging: Perspectives from the behavioral sciences* (pp. 225–264). New York: Cambridge University Press.

Young, C. H., Savola, K. L., & Phelps, E. (1991). *Inventory of Longitudinal Studies in the Social Sciences.* Newbury Park, CA: Sage.

Young, M. D., & Willmott, P. (1973). *The symmetrical family.* New York: Pantheon.

CHAPTER 13

The Cultural Psychology of Development: One Mind, Many Mentalities

RICHARD A. SHWEDER, JACQUELINE J. GOODNOW, GIYOO HATANO, ROBERT A. LeVINE, HAZEL R. MARKUS, and PEGGY J. MILLER

CULTURAL PSYCHOLOGY: HOW IT DIFFERS FROM OTHER APPROACHES TO CULTURE AND PSYCHOLOGY 719
Orienting Definitions 719
WHY CULTURAL PSYCHOLOGY IS NOT CROSS-CULTURAL PSYCHOLOGY 721
MULTIPLE, DIVERSE PSYCHOLOGIES 723
THE MEANING OF MEANING AND A CONTEXT FOR CONTEXT IN CULTURAL PSYCHOLOGY 724
THE UNIT OF ANALYSIS PROBLEM 724
A Custom Complex Example: Who Sleeps by Whom in the Family 725
More on the Custom Complex: The Intimate Association between a Mentality and a Practice Supported by a Cultural Community 727
THE CLASSIFICATION OF PRACTICES 728
THE ANALYSIS OF MENTALITIES 730
THE TWO SIDES OF CULTURAL PSYCHOLOGY 730
CULTURAL PSYCHOLOGY'S THEORY OF MIND 731
CULTURAL PSYCHOLOGY'S SPECIAL USE OF MENTAL STATE CONCEPTS 732
SOCIAL DEVELOPMENT IN THE DIVERGENT INTERPERSONAL WORLDS OF CHILDHOOD 733
THE SOCIAL ORGANIZATION OF CHILDHOOD EXPERIENCE 734
Organizational Settings 734
Care-Giving Relationships 736
Parental Practices 737
Age-Graded Activities 738
CULTURAL MENTALITIES CONCERNING CHILDHOOD SOCIAL RELATIONS 738
Parental Models and Strategies 738
THE EFFECTS OF EARLY INTERPERSONAL EXPERIENCE 739
THE SYMBOLIC MEDIATION OF EXPERIENCE: LANGUAGE AND COMMUNICATIVE CUSTOMS IN CULTURAL PSYCHOLOGY 740
LANGUAGE AS PRACTICE 741
SOCIALIZATION THROUGH LANGUAGE 742
Narrative: Getting Those Stories Straight 744
THE DEVELOPMENT OF SELF 749
DEFINING AND LOCATING THE SELF AS DYNAMIC, MULTILEVEL, AND MULTIFACETED 750
The Conceptual Self 751
The Cultural Self 752
THE ONTOLOGICAL BASIS OF SELF 752
The Person as an Individual 752
The Person as Relational 753
CULTURAL DIVERSITY IN WAYS OF BEING 754
Selfways in Some European American Contexts 755
Selfways in Some East Asian Cultural Contexts 758
Selfways in Still Other Cultural Contexts 761
CULTURAL PSYCHOLOGY AND COGNITIVE DEVELOPMENT 764
Reexamining Thought and Action 764
Hearts and Minds 768
Persons and Contexts 772
CONCLUSION 778
REFERENCES 779

Cultural psychology, no longer a new field, may be more accurately depicted as a *renewed* field (Jahoda, 1990, 1992), approaching the study of mind from deep historical antecedents in the work of eighteenth- and nineteenth-century scholars such as Johann Gottfried von Herder, Giovanni Vico, Wilhelm Dilthey, and Wilhelm Wundt. Herder and Vico pioneered comparative research with the aim of identifying the distinctive characteristics of particular folk and historical traditions. Dilthey raised

This chapter is a revision and update of a manuscript that was originally prepared when the coauthors were members of the

questions about the contrast between the natural science approach and the spiritual or moral science approach to human understanding and the explanation of behavior. Wundt, who is often heralded as the father of modern scientific psychology, also thought deeply about the limits of psychology as an experimental discipline and about its possibilities as an investigation of folk psychologies. Herder's premise that "to be a member of a group is to think and act in a certain way, in the light of particular goals, values, pictures of the world; and to think and act so is to belong to a group" (Berlin, 1976, p. 195) presents a starting point for the contemporary discipline of cultural psychology.

Cultural psychology aims to document historical and cross-cultural diversity in the processes and products of the human mind. The psychological side of cultural psychology is the study of how individual persons think and act in the light of their particular goals, values, and pictures of the world. This is a genre of psychological study based on a definition of the psychological (or of the mental) as consisting of what individual persons want, feel, think, know, and value. The cultural side of cultural psychology is the examination of socially assisted processes of learning and schema activation associated with becoming a member of a particular group. The discipline of cultural psychology gives special attention to the particular wants, feelings, knowledge, reasoning, and values required for normative or competent participation in the local customary practices of some historically identifiable community, especially (although not exclusively) cultural communities that have a capacity to recruit new members through processes of kinship and marriage and wish to perpetuate a particular way of life.

Cultural psychology has been experiencing a major revival since the early 1980s, owed in some significant measure to developmentalists from several fields (e.g., Bruner, 1990a, 1990b; Cole, 1990, 1996; Goodnow, 1990a; A. Gottlieb, 2004; Greenfield, 1997; Greenfield, Keller, Fuligni, & Maynard, 2003; Haidt, Koller, & Dias 1993; Lave, 1990; R. A. LeVine, 1989, 2004; Levy, 1973, 1984; Markus & Kitayama, 1991b; Menon, 2002; J. G. Miller, 1984, 1994b; P. J. Miller & Hoogstra, 1992; Much, 1992, 1993; Rogoff, 1990; Ross, Medin, Coley, & Atran, 2003; Rozin & Nemeroff, 1990; Shweder, 1990a, 1991, 1996a, 1996b, 2003a, 2003b; Shweder & Haidt, 2000; Shweder & LeVine, 1984; Stigler, Shweder, & Herdt, 1990; Super & Harkness, 1997; Weisner, 1984, 1987, 2001; Weisner & Lowe, in press; Wertsch, 1985, 1992). The term *cultural psychology* has also become increasingly popular among European "activity theorists" (Boesch, 1991; Eckensberger, 1990, 1995; see also Brandtstädter, Chapter 10, this *Handbook,* this volume), contextual psychologists of the sociohistorical school (Cole, 1995; Rogoff, 1990; Wertsch, 1991; see also Cole, Chapter 15, this *Handbook,* Volume 2; Elder & Shanahan, Chapter 12, this *Handbook,* this volume), anthropologists interested in the relationship of symbols and meanings to population-based differences in psychological functioning (D'Andrade, 1995; Howard, 1985; R. A. LeVine, 1990a, 1990b; Levy, 1984; Lutz & White, 1986; Shore, 1996; Shweder & LeVine, 1984; G. M. White & Kirkpatrick, 1985), and among developmental, social, and cognitive psychologists in search of a unit of scientific analysis that is larger rather than smaller than the individual person (Bruner, 1986, 1990a, 1990b; Cole, 1988,

Social Science Research Council Planning Committee on Culture, Health and Human Development. We were able to develop and undertake this cooperative project, involving an intellectual division of labor and writing, as a result of our colloquies at SSRC. We are grateful to Diana Colbert of SSRC and Katia Mitova of the University of Chicago who contributed in innumerable and invaluable ways to the completion of this manuscript in its original form. We express our heartfelt gratitude to Frank Kessel, our Program Officer at SSRC, for his collegial contributions not only to this chapter project but also to the various activities of the Committee on Culture, Health, and Human Development over the years of its existence. The skill, balance, and good cheer with which he shepherded the Committee's activities are deeply appreciated. The Planning Committee was supported by grants from the Health Program of the John D. and Catherine T. MacArthur Foundation and the W. T. Grant Foundation. The Center for Advanced Study in the Behavioral Sciences (where Shweder and Markus were Fellows during the 1995/1996 academic year) and the MacArthur Foundation Research Network on Successful Midlife Development (MIDMAC) provided intellectual and material assistance in the preparation of the original review. The current updated revision of the chapter took place during the 2003/2004 academic year. Richard A. Shweder, a Carnegie Scholar (2002), wishes to express his gratitude to the Carnegie Foundation for its generous support. The authors wish to express their great thanks as well to Michele Wittels, who skillfully contributed to the coordination and processing of this revised and updated edition of the chapter.

This chapter is dedicated to our friend and colleague Giyoo Hatano, in honor of his personality, his life, and his work. Even while his sudden and recent death deeply saddens us, the memory of our kind, dedicated and elegant friend and imaginative colleague makes us smile and warms our hearts.

1992; Goodnow, Miller, & Kessel, 1995; Kitayama & Markus, 1994; Medin, 1989; P. J. Miller & Hoogstra, 1992; Nisbett, 2003; Nisbett & Cohen, 1996; Rogoff, 1990; Yang, 1997).

Research in cultural psychology is now featured in several journals, most notably *Culture, Mind and Activity, Culture, Medicine and Psychiatry, Culture and Psychology, Ethos: Journal of the Society for Psychological Anthropology, Psychological Review, The Journal of Personality and Social Psychology,* and *Child Development.* Impressive collections of theoretical, methodological, and empirical papers have appeared (Goodnow et al., 1995; Holland & Quinn, 1987; Jessor, Colby, & Shweder, 1996; Kitayama & Markus, 1994; Rosenberger, 1992; Schwartz, White, & Lutz, 1992; Shweder, 1991, 2003a, 2003b; Shweder & LeVine, 1984; Stigler et al., 1990; G. M. White & Kirkpatrick, 1985). Important monographs and empirical studies have been published (D'Andrade, 1995; Fiske, 1991; Kakar, 1982; Kripal, 1995; Levy, 1973; Lucy, 1992a; Lutz, 1988; Menon & Shweder, 1994; J. G. Miller, 1984; P. J. Miller, 1982; Parish, 1991; Seymour, 1999; Shimizu & LeVine, 2001; Shwalb & Shwalb, 1996). A number of generative proposals have been put forward for comparative research on culture and cognition (Cole, 1990; D'Andrade, 1995; Lave, 1990; Lucy, 1992a, 1992b; Shore, 1996), culture and emotion (Kitayama & Markus, 1994; Mesquita & Frijda, 1992; Russell, 1991; Shweder, 1991, 2003a, 2003b, 2004; Shweder & Haidt, 2000; Wierzbicka, 1992, 1993), culture and morality (Haidt et al., 1993; Jensen, 2005; J. G. Miller, 1994a; Shweder, Mahapatra, & Miller, 1990; Shweder, Much, Mahapatra, & Park, 1997), and culture and the self (Doi, 1981; Herdt, 1981, 1990; Kurtz, 1992; Lebra, 1992; Markus & Kitayama, 1991a, 1991b, 2003; J. G. Miller, 1994b, 1997a; Shweder & Sullivan, 1990). The field has been conceptualized, reconceptualized, and reviewed from many perspectives: in a book-length history (Jahoda, 1992), in a book-length program for a cultural psychology rooted in sociohistorical theory (Cole, 1996), in *Handbook* chapters (Greenfield, 1997; Greenfield et al., 2003; Markus, Kitayama, & Heiman, 1996; J. G. Miller, 1997b), in the *Annual Review of Psychology* (Shweder & Sullivan, 1993; Greenfield et al., 2003), in the Minnesota Symposia on Child Psychology (Masten, 1999), and in the Nebraska Symposium on Motivation (Markus & Kitayama, 2003).

Moreover, the publication of this chapter, which has been updated and revised after its initial publication in the last edition of the *Handbook,* itself signals a continuing appreciation of the value and relevance of cultural psychology to developmental studies. The last edition was the first time that the *Handbook of Child Psychology* included a chapter under the name cultural psychology. It should be acknowledged, however, that this chapter continues a broader conversation about culture and individual development that began in previous editions of the *Handbook,* beginning with Margaret Mead's contribution to the first edition, published in 1931. The section of this chapter on the interpersonal worlds of childhood provides an update of Robert LeVine's chapter in the third (1970) edition of the *Handbook.* And, the Laboratory of Comparative Human Cognition's (LCHC) chapter on culture and cognitive development in the fourth (1983) edition of the *Handbook* is an important predecessor to this chapter, especially the section on cognitive development. We carry forward LCHC's emphasis on the semiotic mediation of experience and on a unit of analysis that does not abstract the individual from his or her social and cultural context or focus exclusively on what is "inside the skin" or "inside the head."

In this chapter, we selectively discuss the cultural psychology of individual development, with special attention to the way in which culture and psyche "make each other up" in the domains of self-organization, thinking, knowing, feeling, wanting, and valuing. The chapter is organized into five sections: an introduction, which lays out major conceptual issues, followed by four topical areas—the cultural organization of early experience, language and socialization, self-development, and cognitive development—although issues concerning moral development and the value-laden nature of mental functioning are addressed throughout the chapter.

We see these topical areas as paradigmatic in the cultural psychology of development, yet we are also keenly aware that several topics of vital interest receive only passing and scattered attention—gender, play, feelings and emotions, spirituality, and physical development. Without any pretense of representing all relevant research agendas or conceptions of the field, we characterize some of the things cultural psychologists have learned about the interpersonal, ideational, and social communicative dimensions of psychological development. In keeping with cultural psychology's commitment to comparative inquiry within and across cultures, we make a special effort to draw from the empirical record in a way that represents the range of

cultural variety in psychological functioning across human groups.

CULTURAL PSYCHOLOGY: HOW IT DIFFERS FROM OTHER APPROACHES TO CULTURE AND PSYCHOLOGY

The main wager of cultural psychology is that relatively few components of the human mental equipment are so inherently constrained, hardwired, or fundamental that their developmental pathway is fixed in advance and cannot be transformed or altered through cultural participation. The bet is that much of human mental functioning is an emergent property that results from symbolically mediated experiences with the behavioral practices and historically accumulated ideas and understandings (meanings) of particular cultural communities. This was the bet of Herder and Vico in the eighteenth century, of Wundt and Dilthey in the nineteenth century, and of Ruth Benedict, Margaret Mead, Edward Sapir, and many other psychological anthropologists in the first half of the twentieth century. It is a bet that the renewed discipline of cultural psychology, informed by contemporary research from several disciplines, is still prepared to make today.

Orienting Definitions

At least since the time of Herder and Vico in the eighteenth century, *cultural psychology* has been a label for the reciprocal investigation of both the psychological foundations of cultural communities and the cultural foundations of mind. It has been a designation for the study of how culture and psyche make each other up. Alternatively stated, cultural psychology is the study of all the things members of different communities mentally experience (know, think, want, feel, value), and hence do, by virtue of being the kinds of beings who are the beneficiaries, guardians, and active perpetuators of a particular cultural tradition.

As a first approximation, we shall define *culture* as a *symbolic and behavioral inheritance* received from out of the historical/ancestral past that provides a community with a framework for other-directed vicarious learning and for collective deliberations about what is true, beautiful, good, and normal. Although it is important to distinguish between the symbolic and the behavioral inheritances of a cultural community (understandings and behaviors are not always fully coordinated from either a socialization or developmental point of view, and actions do sometimes speak much louder than words), given the complexity and richness of culture, any genuine cultural community is always the beneficiary of both symbolic and behavioral inheritances (Shweder, 2003b).

In analyzing the concept of culture, most definitions extant in the literature have tended to be either purely symbolic in emphasis (culture as the beliefs and doctrines that make it possible for a people to rationalize and make sense of the life they lead) or purely behavioral in emphasis (culture as patterns of behavior that are learned and passed on from generation to generation). In our view, the most useful definitions of culture try to honor both inheritances. Such definitions focus on units of analysis that are simultaneously symbolic and behavioral (e.g., Robert Redfield's 1941 definition of culture as "conventional understandings, manifest in act and artifact, that characterize societies," p. 132). Later in this chapter, we discuss in detail a two-sided unit of analysis for cultural psychology called the *custom complex* (J. W. M. Whiting & Child, 1953), and we try to acknowledge and honor both the symbolic and behavioral inheritances of any cultural community.

The *symbolic inheritance* of a cultural community consists of its received ideas and understandings, both implicit and explicit, about persons, society, nature, and the metaphysical realm of the divines. To illustrate, ideas and understandings that are part of the symbolic inheritance of many enlightened secular folk in the European American cultural region include:

- The understanding that infants are born innocent, naive, and free of any prior sins or inherited evils
- The idea that individual wants, preferences, and tastes matter and should be openly expressed and accommodated
- The belief that the main justification for rules, regulations, and any other forms of authority is to promote social justice and enable individuals to pursue their self-interest free of harm and to have the things they want
- The conviction that, other than human nature, the material world is devoid of intentionality and has no will of its own

- The doctrine that God and divinity are archaic notions that should be displaced in the contemporary era
- The related idea that the era in which we live is the most advanced, enlightened, and exceptional in human history and should be classified and heralded as an age of reason

The *behavioral inheritance* of a cultural community consists of its routine or institutionalized family life, social, economic, and political practices. To illustrate, a few of the routine or institutionalized family life practices that are popular among many rural folk in the South-Asian Hindu cultural region include:

- Joint family living (adult brothers co-reside in the same family compound or dwelling space with their living parents and their wives marry in)
- Co-sleeping arrangements of children with their parents
- Separate eating arrangements for husband and wife (no family meal)
- Sexual division of household tasks
- Time-out and seclusion for females during their menstrual period
- Parental hand-to-mouth feeding of children long past infancy and well into middle childhood
- Prohibitions on premarital dating and sexuality
- Physical punishment for unruly or bad behavior
- Arranged marriage between young men and women of similar social status (primarily based on caste, local region, and relative wealth)

Of special import for the cultural psychology of individual development is that human beings are the kinds of beings who benefit from and carry forward a cultural tradition. They try to promote, promulgate, and share their understandings and practices with their children, their relatives, and their community at large. They are active agents in the perpetuation of their symbolic inheritance, largely because (among other motives) the ideas and values that they inherit from the past seem to them to be right-minded, true, dignifying, useful, or at least worthy of respect.

They are also active agents in the perpetuation of their behavioral inheritance. They try to uphold, enforce, and require of each other some degree of compliance with the practices of their community, largely because (among other motives) those practices seem to them to be moral, healthy, natural, rational, benefit promoting, or at least normal.

A noteworthy example of the combination of symbolic and behavioral approaches in cultural psychology is Alma Gottlieb's recent book (2004) about reincarnation beliefs in West Africa and their role in the patterning of infant development. Among the Beng people of Cote d'Ivoire, newborn children are comprehended and perceived as old souls—spiritually powerful, psychologically complex, socially sophisticated, and retaining a memory of previous lives and halcyon times spent dwelling in the abode of the spirits. They do not enter the world naive, at least not according to the Beng. Gottlieb's *The Afterlife Is Where We Come From* offers an eye-opening interpretation of the local cultural meanings of developmental milestones such as the transition from crawling to walking (which is actively discouraged by Beng parents) and the child's early articulation of intelligible speech (which is greeted with anxiety). Her study of Beng infant development and its connection to local beliefs about reincarnation provides an expose of the dangers of presumptively universalizing culture-specific ideals for human development, as she argues that infant development is not, and perhaps ought not to be, the same wherever you go.

From the viewpoint of cultural psychology, the most satisfactory definition of culture presupposes the existence of an active mental agent who not only is the recipient and guardian of a cultural tradition but also is motivated and engaged in some specific way of life. Thus, our definition of culture emphasizes both symbols and behavior. Such an approach also means that a major prerequisite for conducting research in cultural psychology is an imaginative capacity to suspend our disbelief (e.g., one's disbelief that the animating force in the body of an infant is an old soul) and a willingness to set aside (at least temporarily) our own negative moral and emotional reactions (e.g., of anxiety, disapproval, indignation, or disgust) to other people's understandings and practices. To practice cultural psychology, we must be willing and able to enter into other peoples' conceptions of what is right-minded, normal, beautiful, and true (Shweder, 1996b), and we must at least try (we may fail, but that is itself an informative outcome of the methodological effort) to translate their goals, values, and pictures of the world into an intelligible (and perhaps even rationally defensible) account of their behavior.

Thus, cultural psychology is the study of the mental life of individuals in relation to the symbolic and behav-

ioral inheritances of particular cultural communities. It is the study of the way culture, community, and the psyche instantiate one another and are mutually sustaining, and, thus, how they become coordinated and make each other possible. A cultural tradition dies (it exists only in a canonical text or in an ethnographic book on a library shelf) if there is no community that lives its doctrines, makes manifest its shared understandings, or inhabits its way of life. Similarly, some designated category of persons (e.g., Latinos, non-Hispanic Whites; residents of the Pacific Islands; citizens of the United States) is not a cultural community unless its members actively inhabit, think about, and hold each other accountable to some symbolic and behavioral inheritance from out of some historical/ancestral past that they identify with as a people, and claim as their own.

WHY CULTURAL PSYCHOLOGY IS NOT CROSS-CULTURAL PSYCHOLOGY

Many proponents of *cultural psychology* distinguish it from *cross-cultural psychology.* This is what a few of those authors have to say about the aims of a renewed cultural psychology, and the ways in which it differs from the discipline or research enterprise known as cross-cultural psychology.

Shweder and Sullivan (1993; also Shweder, 1990a) identify the aim of cultural psychology as the study of ethnic and cultural sources of psychological diversity in self-organization, cognitive processing, emotional functioning, and moral evaluation. They describe cultural psychology as a "project designed to reassess the uniformitarian principle of psychic unity [which they associate with cross-cultural psychology] and aimed at the development of a credible theory of psychological pluralism." They argue that performance or response differences between populations arise from differences in the normal meaning of stimulus situations and materials across populations (the problem of "partial translation" or "limited commensurability"). They suggest that a special feature of cultural psychology is its recognition that "through the methodical investigation of specific sources of incommensurability in particular stimulus situations (so-called thick description) a culture's distinctive psychology [the way people think and act in the light of particular goals, values, and pictures of the world] may be revealed." For example, Shweder et al. (1997; also see Jensen, 2005; Shweder et al., 1990) describe the different moral developmental pathways and patterns of moral judgment for children in societies privileging an "ethics of autonomy" (where individualism, having the things you want, and harm, rights, and justice concepts predominate) in contrast to societies privileging an "ethics of community" (where notions of duty, sacrifice, loyalty, and hierarchical interdependence and other social roles based on communitarian moral concepts predominate) or societies privileging an "ethics of divinity" (where notions of sanctity, purity, pollution, and the connection between the sacred order and the natural order predominate).

A similar point is made by Greenfield (1997) who notes, "It is the human capacity to create shared meaning that produces the distinctive methodological contribution of cultural psychology." She goes on to argue that it is a mistake of modern psychology in general and modern cross-cultural psychology in particular to treat perspective (the shared meanings of a group is a type of perspective) as a form of bias that should be eliminated from research procedures. She contrasts the methodology of cultural psychology with that of modern cross-cultural psychology as follows:

> The methodological ideal of the paradigmatic cross-cultural psychologist is to carry a procedure established in one culture, with known psychometric properties, to one or more other cultures, in order to make a cross-cultural comparison (Berry, Poortinga, Segall, & Dasen, 1992). In contrast, the methodological ideal of the paradigmatic cultural psychologist is to derive procedures for each culture from the lifeways and modes of communication of that culture.
>
> This ideal explains why interpretive methods, especially ethnographic methods, have been so important to many cultural psychologists. Ethnographic approaches were devised originally by cultural anthropologists as a means of understanding other cultures on their own terms—not as projections of the researcher's own ethnocentric assumptions (Malinowski, 1922). The goal is to understand what people say and do from the perspective of insiders to the culture, to render them intelligible within their own collectively shared interpretive frameworks. From this standpoint, comparisons within and across cultures make sense only when they are grounded in descriptions of the local meanings of the people being studied. At the same time, these approaches carry with them the reflexive recognition that researchers too are members of particular communities and cultures; that they may come to see their own local meanings in a new light by way of studying people who construe the world differently.

For further discussion of interpretive and ethnographic methods as applied to the study of children, see C. D. Clark (2003); Corsaro and Miller (1992); Erickson (1986); Jessor et al. (1996); P. J. Miller, Hengst, and Wang (2003).

One useful metalanguage or theoretical framework for the nonethnocentric identification and comparative translation of culture-specific aspects of mental functioning has been developed by the anthropological linguists Anna Wierzbicka and Cliff Goddard (Goddard, 1997, 2001; Goddard & Wiezbicka, 1994; Wierzbicka, 1986, 1990, 1993, 1999; see also Shweder 2003a, 2004). Wierzbicka and Goddard have identified a core set of semantically simple, intuitively obvious, universal folk concepts (such as good, true, want, feel, do) that can then be used to elucidate the particular ways the mental states of members of different cultural groups vary. For example, in the domain of feelings and emotions those authors have effectively made the provocative point that the contemporary American notion of "sadness" has several cultural specific features (not even shared by various Northern European subcultures), and they have proposed that the very idea of an emotion (in contrast to the idea of a feeling) is not a semantically simple, intuitively obvious, or universal folk concept.

To return to Greenfield, one powerful (and somewhat ironic) implication of her analysis would seem to be that the genuine existence of different cultural realities is incompatible with the methodological assumptions of cross-cultural psychology. More specifically, if your research procedures and instruments travel readily and well (e.g., they are easy to administer and they display the same psychometric properties from one test population to another) then you probably have not traveled far enough into a truly alternative cultural world.

This may explain why long- and short-term fieldwork, language learning, naturalistic observation, detailed ethnography, and the analysis of the semantics and pragmatics of everyday discourse and communication are central to the study of cultural psychology, yet have played a minimal role in cross-cultural psychology. It may explain why much of the evidence in cross-cultural psychology (yet relatively little of the evidence in cultural psychology) is derived from observations in university laboratories, or from inventory or test procedures administered primarily to relatively cosmopolitan university students in other lands.

The Western institution of the university carries with it many features of an elite cosmopolitan culture wherever it has diffused around the world. University students in Tokyo, Nairobi, New Delhi, and New York may be far more like one another (and like the Western researcher) than they are like members of their respective societies whose life ways are embedded in less familiar indigenous understandings, institutions, and practices. Even if you have traveled 10,000 miles to get there, a university setting in another land may be much closer than you think.

Much (1995) drives home this point with the following observation:

> It is especially important to be clear about one distinction. Cultural psychology is not the same as "cross-cultural psychology," which is a branch of experimental social, cognitive and personality psychology. The chief distinction is that most of what has been known as "cross-cultural psychology" has presupposed the categories and models that have been available to participate in experiments or even to fill out questionnaires. . . . The argument often assumed to justify the tactic of studying mostly student behavior is based upon a sweeping and gratuitous universalist assumption—since we are all human, we are all fundamentally alike in significant psychological functions and cultural (or social) contexts of diversity do not affect the important "deep" or "hard wired" structures of the mind. There are several problems with this position. One is that there have been few if any satisfactory identifications of deep, hard wired and invariant mental structures which operate independently of the context or content of their functioning; the "method variance" problem in experimental psychology is related to this fact. Another problem is that even though there may be certain biologically based psychological foundations . . . this does not necessarily mean (1) that they are invariant across individuals or populations or (2) that culture does not affect their development as psychological structures and functions.

Whereas Greenfield and Much draw some methodological contrasts between cultural versus cross-cultural psychology, J. G. Miller (1997b) envisions the difference between cultural psychology and cross-cultural psychology in theoretical terms (although a similar theoretical point can be found in Greenfield and Much). She suggests, "The dominant stance within cultural psychology is to view culture and psychology as mutually constitutive phenomena which cannot be reduced to each other." She adds that such a stance "contrasts with the tendency in cross-cultural psychology for culture to be conceptualized as an independent variable that impacts on the dependent variable of individual psychology."

Markus et al. (1996) carry forward this point. With an intent to simultaneously study the cultural origins of mind and the mental side of culture, they argue that "culture and psychology, regardless of the level at which they are analyzed, are interdependent and mutually active." Markus et al. suggest:

> The communities, societies, and cultural contexts within which people participate provide the interpretive frameworks—including the images, concepts, and narratives, as well as the means, practices and patterns of behavior—by which people make sense (i.e., lend meaning, coherence and structure to their ongoing experience) and organize their actions. Although experienced as such, those organizing frameworks (also called cultural schemas, models, designs for living, modes of being) are not fully private and personal; they are shared.

Markus et al. go on to say:

> Importantly, the contention here is that these group-based meanings and practices are not separate from observed behavior. They are not applied as interpretive frameworks after "behavior" has occurred. Instead they are fully active in the constitution of this behavior; they are the means by which people behave and experience, and thus should be taken into account in an analysis of this behavior. The claim is that with respect to the psychological, the individual level often cannot be separated from the cultural level. Many psychological processes are completely interdependent with the meanings and practices of their relevant sociocultural contexts and this will result in systematic diversity in psychological functioning. It follows from this perspective that there may be multiple, diverse psychologies rather than a single psychology.

MULTIPLE, DIVERSE PSYCHOLOGIES

Perhaps, the central claim of cultural psychology (in contrast to other approaches to the study of consciousness and mental life) is that "there may be multiple, diverse psychologies rather than a single psychology," and perhaps the central problematic of the field is to make sense of that provocative claim. Does such a claim entail the denial of universals? If not, what universals of mind are entailed by cultural psychology? How are those universals to be reconciled with the existence of diverse psychologies across human populations without trivializing that diversity or treating it as mere content?

Currently, there is no single answer that all cultural psychologists would endorse. One type of answer, with a pedigree stretching back to Vico (Berlin, 1976), suggests that "the nature of [human beings] is not, as has long been supposed, static and unalterable or even unaltered; that it does not so much as contain even a central kernel or essence, which remains identical through change; that the effort of [human beings] to understand the world in which they find themselves and to adapt it to their needs, physical and spiritual, continuously transforms their worlds and themselves" (p. xvi).

A second type of answer to those questions, to be developed in this chapter, starts from the premise that any human nature that we are in a position to understand and render intelligible must have "a central kernel or essence," but it is rarely a strong constraint. According to this answer, the central kernel or essence of human nature consists of a heterogeneous collection of mutually contradictory structures and inclinations, which are differentially and selectively activated, brought "online," and given character and substance in the course of the historical experience of different cultural communities. The motto "One mind, many mentalities: universalism without the uniformity" is the rallying cry for the interpretation of the claim that there may be multiple, diverse psychologies rather than a single psychology.

This motto advertises a discipline founded on the principle that the abstract potentialities and specific heterogeneous inclinations of the human mind are universal but only gain character, substance, definition, and motivational force (i.e., assume the shape of a functioning mentality) as they are translated and transformed into and through the concrete actualities of some particular practice, activity setting, or way of life (Cole, 1990; D'Andrade, 1995; Goodnow et al., 1995; Greenfield, 1997; Greenfield et al., 2003; Lave, 1990; Markus et al., 1996; Much, 1992; Nisbett & Cohen, 1995; Rogoff, 1990; Shweder, 1991; Shweder & LeVine, 1984). The slogan connects current researchers in cultural psychology with the intellectual ancestors of the field (Vico, Herder, and others; Berlin, 1976) who, Kant- and Hegel-like, believed "Form without content is empty, content without form meaningless."

For at least 200 years, a distinctive tenet of cultural psychology has been the claim that the formal universals of mind and the content-rich particulars of any sustainable mentality or way of life are interdependent, interactive, and give each other life. Scholars, such as Herder, Vico, and Wundt, scoured the historical record for successful (cohesive, shared, stable) fusions of form and content in which the human imagination has, of necessity, gone beyond the relatively meaning-barren

constraints of logic and mere sense perception to construct an imaginative (and culture-specific) picture of the underlying nature of the world and it values, resulting in a *mentality* (the Homeric mentality, the Hindu mentality, the Christian fundamentalist mentality) supportive of a way of life.

They took as their data the great symbolic formations produced by human beings: myths, folk tales, language patterns, naming systems, ethnoscientific doctrines, and ethical, social, and religious philosophies. They also took as their data the great behavioral formations produced by human beings, including customary practices of various kinds: subsistence activities, games, rituals, food taboos, gender roles, the division of labor, and marriage rules. They interpreted those symbolic and behavioral formations as alternative manifestations, substantializations, or instantiations of the disparate abstract potentialities of the universal mind, which they believed was the business of cultural psychology to characterize and to explain.

THE MEANING OF MEANING AND A CONTEXT FOR CONTEXT IN CULTURAL PSYCHOLOGY

In contemporary cultural psychology, the translation and transformation of one mind into many mentalities is typically conceptualized as a process by which contexts and meanings become essential, active components inside as well as outside the psychological system of individuals. In cultural psychology, this process is sometimes described as the process by which culture and psyche make each other up.

This insistence in cultural psychology that contexts and meanings are to be theoretically represented as part of the psychological system and not simply as influences, factors, or conditions external to the psychological system distinguishes cultural psychology from other forms of psychology, which also think of themselves as contextual (or situated). The aim in cultural psychology is not first to separate the psychological system from its nonpsychological context and then to invoke some type of external setting effect or outside situational influence on psychological functioning. The aim and the challenge are rather to recast or soften the contrast between person and context (inside versus outside, subjective perspective versus external reality) so that the very idea of a context effect will take on new meaning because our theoretical language for psychological description will be contextual from the start. In part, cultural psychology involves the study of real things that do not exist independently of some collectively shared point of view. Later in this chapter, we address in some detail this issue, of dichotomies that need to be softened or recast (see also Overton, Chapter 2, this *Handbook,* this volume).

The distinction between cultural psychology and other contextual approaches in psychology is subtle, important, and easy to overlook because all approaches to psychology that emphasize context share much in common, especially their opposition to the idea that the science of psychology is primarily the study of fixed, universal, abstract processes or forms. Thus, cultural psychology shares with other contextual psychologies the assumption that the mind of human beings (knowing, wanting, feeling, valuing, etc.) can only be realized through some situated or local process of "minding," which is always bounded, conditional, or relative to something—shared meanings, goals, stimulus domain, available resources, local artifacts, cognitive assistants, and so on. Beyond that general point of similarity, cultural psychology should be understood as a rather special type of contextual approach.

In the conception of cultural psychology developed in this chapter, the relevant contexts for the realization of mind are the customs, traditions, practices, and shared meanings and perspectives of some self-monitoring and self-perpetuating group. The primary emphasis is on contexts thought to be relevant for the realization of mind in the sense that such contexts are the means for transforming a universal mind into a distinctively functioning mentality, a distinctive way that "people think and act in the light of particular goals, values and pictures of the world" (Berlin, 1976). In this approach, cultural psychology is not coextensive with contextual psychology (more on this in a moment). More important, the contrast between inside and outside, person and context, and subjective perspective and external reality is reconceptualized in cultural psychology as a process by which culture and psyche are constantly and continuously making each other up.

THE UNIT OF ANALYSIS PROBLEM

Just as the general field of psychology seems unsure whether its proper subject matter should be the study of

behavior or the study of consciousness or the study of the mental life (which is a broader subject than the study of consciousness because it includes states of mind that are not in awareness), so too cultural psychologists do not always seem to agree on their proper unit of analysis. Practitioners of cultural psychology study mentalities, folk models, practices, activity settings, situated cognitions, and ways of life. It is not clear whether these units of analysis mentioned in the literature are different ways of speaking about the same intellectual object or whether it is possible to combine them into a single unit of analysis.

For the sake of clarity in this review, we adopt a proposal for a common unit of analysis for cultural psychology put forward more than a generation ago (J. W. M. Whiting & Child, 1953) in an exemplary collaboration between an anthropologist and a psychologist. Whiting and Child suggest combining mentalities and practices (the symbolic and behavioral inheritances of a cultural community) into a single unit of analysis called *the custom complex,* which "consists of a customary practice and of the beliefs, values, sanctions, rules, motives and satisfactions associated with it" (p. 27). If we adopt this proposal, cultural psychology can be defined as the study of the custom complex.

Although J. W. M. Whiting and Child introduced the idea of a custom complex in 1953, its theoretical implications were not widely or fully appreciated at the time. Curiously, the idea was not taken up or carried forward by psychological anthropologists working in the classical tradition of the 1950s. It was not until the 1980s and 1990s, with the rebirth of a two-handed cultural psychology focused on the way culture and psyche make each other up, and with the return of an interest in "activity settings" (Cole, 1992, 1995; Weisner, 1984, 1996, 2001, 2002) and a "practice approach" to developmental studies (Goodnow et al., 1995), that J. W. M. Whiting and Child's conception gained currency and appeal.

If a custom complex "consists of a customary practice and of beliefs, values, sanctions, rules, motives and satisfactions associated with it," then the idea bears some resemblance to the social psychologist's idea of a personal "life space" (Lewin, 1943), to the sociologist's idea of a societal "habitus" (Bourdieu, 1972, 1990), and to the historian's idea of an epochal "mentality."

Using the custom complex as a unit of analysis makes it possible to conceptualize cultural psychology as the study of the way culture and psyche are socially produced and reproduced, resulting in an intimate association between a mentality and a practice and a partial fusion of person/context, inside/outside, or subjective perspective/external reality.

Examples of a custom complex are so commonplace they are easy to overlook. They include the mentalities associated with nursing on demand, co-sleeping in a family bed, the family meal, enforcing strict Christian discipline, performing the ritual of "what did you do in school today," or practicing ways to bolster self-esteem.

A Custom Complex Example: Who Sleeps by Whom in the Family

The mentality (what people know, think, feel, want, value, and hence choose to do) intimately associated with the practice of "who sleeps by whom" in the family provides a paradigmatic example of a custom complex. Who sleeps by whom in a family is a customary practice invested with socially acquired meanings and with implications for a person's standing (as moral, rational, or competent) in some consensus-sensitive and norm-enforcing cultural community.

Research on family life customs in different communities in the United States (Abbott, 1992; Okami & Weisner, in press; Okami, Weisner, & Olmstead, 2002; Weisner, Bausano, & Kornfein, 1983) and around the world (Caudill & Plath, 1966; LeVine, 1989, 1990a, 1990b; McKenna et al., 1993; Morelli, Rogoff, Oppenheimer, & Goldsmith, 1992; Shweder, Balle-Jensen, & Goldstein, 1995; J. W. M. Whiting, 1964, 1981) confirms the existence on a worldwide scale of several divergent custom complexes in this domain, each consisting of a network of interwoven and mutually supportive practices, beliefs, values, sanctions, rules, motives, and satisfactions. Indeed, on a worldwide scale, the European American who-sleeps-by-whom custom complex is not the one that communities most typically produce, reproduce, and enforce with the various formal and informal powers (e.g., legal interventions, gossip, and effects on reputation) at their disposal.

The middle-class European American custom complex includes the ritualized isolation of children during the night, the institution of bedtime, and the protection of the privacy of the sacred couple upheld by a cultural norm mandating the exclusive co-sleeping of the husband and wife. This European American custom complex is typically associated with something like the following propositional attitudes, where knowing,

thinking, feeling, wanting, and valuing define the set of potential attitudes, and thus can be stated in propositional form:

> I value autonomy and independence; I want my children to become autonomous and independent adults; I know that I can promote autonomy and independence in infants and young children by having them sleep alone; I value sexual intimacy with my spouse; I know that a sleeping space is the most suitable site for sexual intimacy with my spouse; I know that it will not be possible to have sexual intimacy with my spouse if the privacy of the spousal sleeping space is violated; I know that children have erotic impulses and a sexual fantasy life that should not be aroused or titillated by adults for the sake of the mental health of the child; I don't want to damage the mental health of my children or make them unhappy and neurotic about sex or touching; I feel anxious about touching and having prolonged skin-to-skin contact with a young child; therefore, infants and young children should be trained, encouraged, and if necessary, forced, to sleep alone.

This custom complex is sanctioned, glorified, rationalized, and enforced in innumerable ways in the European American culture area, although nearly every one of those propositional attitudes is thought to be wrong, bizarre, or beside the point by adults and children in many parts of Asia, Africa, and Central America, where children routinely and habitually co-sleep with one or more of their parents and/or siblings and prefer to do so even when more than ample sleeping space is available for separate sleeping arrangements (Abbott, 1992; Brazelton, 1990; Caudill & Plath, 1966; Shweder et al., 1995).

In the early 1960s, Caudill and Plath (1966) discovered that (a) urban Japanese parents felt morally obliged to provide their children with a parental sleeping partner, (b) husbands and wives were willing to separate from each other to do so, and (c) approximately 50% of 11- to 15-year-old urban Japanese boys and girls slept in the same room as their mother or father or both. In another example, Shweder et al. (1995) discovered from a record of single-night sleeping arrangements in 160 high-caste households in Orissa, India, that only 12% of the cases matched the European American custom complex in which husband and wife sleep together and separate from their children.

The cluster of propositional attitudes that lend authority to co-sleeping still need to be worked out for the different culture regions of the world (although see Morelli et al., 1992). The Japanese custom complex includes the propositional attitudes:

> I value and want to promote interdependency and feelings of closeness and solidarity among members of the family; I know that co-sleeping will help children overcome feelings of distance and separation from members of the family who are older or of a different sex.

The Oriya Hindu custom complex includes the propositional attitudes:

> I highly value children as members of the family; I know that children are fragile, vulnerable, and needy and therefore should not be left alone and unprotected during the night.

Chastity anxiety and the chaperoning of adolescent females also play a part in the Oriya custom complex (Shweder et al., 1995).

Examples of the way local experts (pediatricians, advice columnists, or social workers) rationalize, uphold, and lend authority to the European American custom complex can be found in the responses of "Dear Abby" and "Ann Landers" to the many letters they receive about the perceived problem of parent-child co-sleeping. The following, published May 26, 1994, in the Chicago Tribune, is a typical exchange between concerned adults in the European American cultural zone:

> Dear Abby: My niece—I'll call her Carol—is a single mother with a 4-year-old son. (I'll call him Johnny.) Carol just turned 40. Since the day Johnny was born, he has slept with his mother in a single bed. They go to bed between 8 and 10 o'clock every night and always have snacks and drinks in bed. They watch TV and cuddle until Johnny falls asleep in his mother's arms. Abby, this child has never fallen asleep alone. Carol lives with her parents, and there is no shortage of beds in their home. Recently, Carol and Johnny visited me in my country home, and I gave them the bedroom with twin beds. The following morning, I discovered that Carol had pushed the beds together so she and Johnny wouldn't be separated. I think Carol's emotional needs are taking precedence over what is best for her son. He has no father, and his grandparents have no say in his upbringing. I would appreciate your as-

sessment of this situation. No city, please, and sign me, Concerned Aunt.

Dear Concerned: You have good reason to be concerned, You hit the nail on the head—Johnny doesn't need to sleep with his mother nearly as much as she needs to sleep with him. You would be doing Carol an enormous favor if you advised her to get counseling in the rearing of her son. With all her good intentions, she is "(s)mothering" her son. Johnny's pediatrician will be able to recommend the best counselor for Carol and Johnny. It is desperately needed.

Surprisingly little is known about the long-term effects of nighttime isolation or separation versus co-sleeping in any part of the world, which is a major lacuna in the history of research in cultural psychology. Nevertheless, with the publication of an important longitudinal study by Okami et al. (2002; see also Okami & Weisner, in press) there is now some empirical grounds for being suspicious about any strong or generalized claims about the long-term effects on children of sleeping alone versus co-sleeping with one or more parents.

More on the Custom Complex: The Intimate Association between a Mentality and a Practice Supported by a Cultural Community

The concept of a custom complex presupposes an intimate association between a mentality and a practice that is supported, enforced, defended, and rationalized by members of some cultural community. When such an association is in place, it will be the case that other members of the cultural community will judge the mentality associated with the practice to be normal and reasonable, while any actual participant in the practice will experience the mentality associated with the practice to be under the skin, close to the heart, and self-relevant; the mentality will have become habitual, automatic, and can be activated without deliberation or conscious calculation—it will have become internalized. This intimate (some might say experience-near) connection or partial fusion of a mentality and a practice does not, however, prohibit us from drawing an analytic distinction between the mentality and the practice that instantiates it. It does not keep us from characterizing the custom complex as two things intimately connected or partially fused.

The study of a custom complex calls for the analysis of a two-sided thing—the intimate connection between a mentality (the symbolic inheritance of a cultural community) and one or more specific practices (the behavioral inheritance of a cultural community). This analysis begins with the systematic identification, through observation and interviews, of the routine or habitual family life and social practices engaged in by members of some self-monitoring and self-regulating group. Some of these practices may surprise, disgust, or enrage an outside observer, although to the jaded eyes of the group members their own practices are likely to seem ordinary, decent, and reasonable or at least "normal."

Each of the following practices, for example, is a commonplace way of being, at least for the members of the particular cultural communities that uphold them. In one cultural world, a 2-year-old child gets in bed with his or her mother, unbuttons his or her mother's blouse, suckles at her breast, and sleeps by her side throughout the night. In another cultural world, each child in the family sleeps in a private sleeping space separated from the sleeping space of all adults. In one cultural world, a woman brings food home from the market and cooks it, and then she and her husband consume the food together. In another cultural world, a man brings food home from the market, his wife cooks it at home, and he consumes the food alone and his wife eats separately and later. In one cultural world, children are fostered by their parents to more prosperous families in their society who subject these children to ordeals of hardship, physical punishment, and demanding tests of loyalty, requiring them to work as family servants until they endure the ordeals and pass the tests (Bledsoe, 1990). Then the children are adopted and supported by those families and patronized and provided for throughout life. In another cultural world, however, parents get upset (even incensed) if another adult touches their child, reprimands or scolds their child, makes strenuous demands of their child, or causes their child to suffer abuse in any way.

As noted earlier, the analysis of a custom complex ends when one is able to spell out as comprehensively as possible the things that the members of some group (tacitly or explicitly, consciously or unconsciously) know, think, feel, want, and value that explain and make intelligible the things that they do. Thus, the analysis begins with the identification of practices and it ends with the specification of a distinctive mentality.

This interest in the distinctive mentality associated with the practices of a cultural community distinguishes cultural psychology from other approaches to the study of practice domains in which it is assumed that human activities come in natural domains or universal kinds (e.g., religion, economics, family life, schooling, or politics) and

that members of different cultural communities think and behave more or less alike because of the strong constraints of each species of activity, regardless of community. The idea of a custom complex invites a very different approach in which it is assumed that members of various cultural communities have distinctive mentalities associated with each of their practice domains (e.g., a Taiwanese mentality of family life versus a New England mentality of family life), leading members of those cultural communities to engage in divergent patterns of behavior in ostensibly similar domains.

The idea of a custom complex also invites cultural psychologists to address the question of whether a particular cultural community has a characteristic mentality (e.g., the Protestant mentality), which leaves its generalized mark on many domains in that community, thereby making, for example, Protestant economics, Protestant religion, and Protestant family life more like each other than like a parallel natural domain in another cultural community.

We emphasize, however, that cultural psychology does not presume the existence of global consistency or thematic integration across all practice domains in a culture. Even Ruth Benedict (1934) was quite aware that many cultures are not patterned after some simple mold (Dionysian, Apollonian) or fundamentally integrated by a single theme (e.g., the work ethic). She knew, as we know, that the degree to which a small set of core beliefs, goals, or motives can account for the meaning and behavior of a people across the many domains of their life (family, work, and politics) is entirely an open empirical issue.

There is no way to know in advance of years of research in some particular cultural community whether their many practice domains all draw on the same mentality. Nevertheless, even if a particular cultural community is not thematically integrated (one small set of core meanings revealed in many practice domains), the custom complex is still a natural theoretical frame of analysis for cultural psychology. The idea defines a parameter space for conceptualizing and modeling the ways that culture and psyche make each other up, resulting, on a worldwide scale, in multiple instances of a relatively stable or equilibrated condition in which a mentality and a practice are mutually sustaining and reciprocally confirmatory. Not all custom complexes are integrated in the same way or cohere to the same degree. Nevertheless, the idea makes it possible for us to ask about the ways and degrees to which a relatively stable equilibrium (the intimate association of a local mentality and a cultural practice) has actually been achieved.

THE CLASSIFICATION OF PRACTICES

To conduct a relatively complete and systematic empirical study of a community's cultural psychology, it is necessary to identify the members' practices and categorize them into domains. Practices can be categorized in many ways, because any scheme of classification will depend largely on the investigator's theory of human needs (physical, social, psychological, and spiritual) and the research issues at hand.

One of the several ways practices can be classified into domains is from an ontogenetic perspective, with special reference to the development of mastery or expertise in some domain of psychological functioning (knowing, thinking, feeling, wanting, or valuing). Thus, practices might be identified and classified by reference to the particular substantive type of competence they promote (e.g., practices promoting social sensitivity, practices promoting moral development, practices promoting cognitive development). For example, a recent study (Munroe, in press) of 3- to 9-year-olds in four cultures (the Logoli of Kenya, Newars of Nepal, Black Carib of Belize, and American Samoans) produced the counter-intuitive and provocative finding that children are more willing to engage in opposite gender sex role play and seem less threatened by sex role confusions in societies that have institutionalized adult patriarchal or patricentric practices such as male dominance, gender segregation, and a strict sexual division of labor. Although one can only speculate based on the data presented in Munroe's study, one might entertain the hypothesis that where gender is culturally sanctioned as a basis for social organization the interest and capacity to imaginatively take the perspective of the other across the gender division is more highly developed.

Or a developmentalist might classify practices not so much according to the substantive competence (e.g., taking the perspective of others) acquired but rather according to types of processes of acquisition. Werker (1989; also G. Gottlieb, 1991), has generated a short list of hypothetical ways that experience (read exposure to or active participation in a cultural practice) can affect the development of any mental skill or ability. She imagines five kinds of processes:

1. Maturation (the practice made no difference; the ability would have developed without it).

2. Facilitation (because of the practice, the ability was attained more quickly than otherwise would have been the case).
3. Induction (without the practice, there would have been no ability at all in this domain).
4. Attunement (because of the practice, a higher level of ability was attained than otherwise would have been the case).
5. Maintenance/loss (the ability was preexisting but would have been lost or deactivated if it had not been kept online through participation in the practice).

At this early stage in the evolution of a cultural psychology of individual development, we can only look forward with excitement to the time when we will have in hand the research designs, methodologies, and systematically collected bodies of evidence that will allow us to classify practices in this way. We look forward to the time when we will be able to distinguish between each of those five interpretations of the effects of participation in a cultural practice on the growth of a mental state or ability.

Cultural psychology is, however, not committed to a blank-slate learning theory (the blank-slate stance is a straw person, and not even John Locke posited an entirely empty organism prior to learning from childhood experience) nor does it presuppose an induction theory of mental development. Quite the contrary, much of the current research in cultural psychology is quite compatible with (and may even presuppose) either an attunement or a maintenance/loss account of the differential emergence, activation, or selective maintenance of particular mental states. Our conception of cultural learning is discussed later, especially in relationship to innate ideas.

In this chapter, we can seldom choose between different interpretations (maturation, attunement, maintenance/loss, etc.) of how participation in a cultural practice affects the activation of a mental state or the emergence of a mental skill. What we can do, however, as an intermediary step in building a full-blown cultural psychology of individual development, is point to some of the research and scholarship in cultural psychology that tries to describe and explain the differential ontogenetic emergence, activation, and selective maintenance of what the "I's" in different groups know, think, feel, want, value, and hence choose to do, including research about the "self." Later in this chapter, we examine one important line of cultural psychological research on the development of an *interdependent* (sociocentric, collective) versus *independent* (autonomous, individualistic) self, but the cultural psychology project has general implications for claims about mental development that are quite independent of any particular findings in any particular domain.

For example, comparative research by Ross et al. (2003) has suggested that cognitive developmental theories presumptively positing a universal anthropocentric stage in the development of children's folk biological knowledge (the idea that young children everywhere initially project a naive human psychology onto nonhuman species) are more accurately viewed as local descriptions of the course of mental development for urban majority children who grow up with an impoverished experience of nonhuman nature. Native American Menominee children and rural children from mainstream populations in the United States, whose involvement with plants and nonhuman animals is positively structured and mediated by cultural beliefs and practices of various sorts, do not display the predicted universal developmental pattern and exhibit competences in ecological reasoning that are absent from the mentality of the urban, mainstream kids in the United States.

There are many other ways to classify cultural practices into domains. From the point of view of personal and social identity, cultural practices might be identified and classified by the existential problems they address. In any society, there are many existential questions, which must be answered for the sake of both individual mental health and social coordination:

- *Self practices* answer: "What's me or mine, and what's not me or mine?"
- *Gender practices* answer: "What's male, and what's female?"
- Disciplinary practices answer: "How are norms and rules to be enforced?"
- *Distributional practices* answer: "How should burdens and benefits be distributed?" (Shweder, 1982)

A closely related approach has been proposed by Fiske (1991, 1992), who argues that social life is comprised of four social relationships: communal sharing, authority ranking, equality matching, and market pricing. Fiske's scheme could readily be adapted and used in the classification of practices (practices promoting a sense of commonality, the importance and legitimacy of hierarchy, etc.). Some researchers may prefer to identify and classify practices by the institutions in which they are embedded (e.g., family-life practices, school-life practices). Other researchers, with different intellectual

aims and inclinations, may prefer to classify practices according to the biological needs or physical survival functions they serve (e.g., eating practices, health practices, or sexual practices).

Still others may want to proceed emically (Pike, 1967), which involves letting the classification of practice domains go hand in hand with the specification of the mentality of a cultural community, in the anticipation of some counterintuitive and astonishing results. In some cultural communities, for example, among devout Brahmans in India, there is a highly elaborated practice domain that might be labeled oblations, sacrifices, and sacramental offerings. It encompasses the daily preparation and consumption of food and includes in the same general practice domain other activities (e.g., prayer and animal sacrifice) that would never naturally go together in the mentality of a Western researcher. Among Hindu Brahmans in India, food is not a personal preference system. Given the local culturally elaborated idea that eating is a sacramental offering to a divinity (the self is conceptualized as a piece of divinity) residing in a temple (the human body), what you eat, how and by whom it has been prepared, and the conditions under which you eat is a mark of your moral standing and social status in the world.

THE ANALYSIS OF MENTALITIES

Mentalities are the other side of the custom complex. They can be investigated in the following ways: (a) by analyzing the idea of a mentality into its component parts: knowing, thinking, feeling, wanting, and valuing; (b) by modeling what some ideal or prototypical "I" (subject, agent, individual, or self) who might be engaged in this or that practice might know, think, feel, want, and value; (c) by empirically determining the degree of specificity or generality of those components of a mentality for actual agents across practice domains in a cultural community (and perhaps across cultural communities for a particular practice domain); and (d) by pointing to broad patterns of generality for mentalities when and where they exist.

For example, there is good empirical reason to believe that the mentality dubbed *interdependency, sociocentrism,* or *collectivism* supports and maintains a whole array of practices both in and across domains for some populations in Japan, while the mentality dubbed *independence, autonomy,* or *individualism* supports and maintains a disparate array of practices both in and across domains for some groups in the United States (Markus & Kitayama, 1991a, 1991b; Triandis, 1989, 1990).

Thus, although cultural psychology is, in one major sense, the study of the way culture and psyche make each other up; in another closely related sense, it is also the study of the origin, structure, function, operation, and social reproduction of that intimate association between a mentality and a practice known as the custom complex.

THE TWO SIDES OF CULTURAL PSYCHOLOGY

Cultural psychology is the study of the way culture and psyche make each other up, resulting in the formation of the custom complex, which is a unit of analysis for characterizing the way multiple, diverse psychologies emerge out of the abstract potentialities of a universal mind. Psychological pluralism emerges, at least in part, because peoples think and act in the light of particular goals, values, and pictures of the world. Those factors are rarely the same across cultural communities.

The cultural side of cultural psychology is the study of the mentality-laden practices (including the symbolic forms, communicative exchanges, rituals, mores, folkways, and institutions) developed, promoted, promulgated, enacted, and enforced (and hence judged to be customary, normal, legal, moral, or reasonable) by the "I's" (the subjects, agents, individuals, or selves) of particular groups.

The psychological side of cultural psychology is the study of practice-related mental states, the things that the "I's" (subjects, agents, individuals, selves) of particular groups know, think, feel, want, value, and hence choose or decide to do to carry forward the normal practices of their society.

Based on those two sides of cultural psychology, which are fused in the idea of a custom complex, the aim of the discipline is to investigate precisely those cases where the following three conditions hold:

1. A "practice" displays significant variation across groups and differential patterning of within-group variations (e.g., there is a far greater probability of children and adults co-sleeping in a family bed in South Asia and Africa than in Europe and the United States and the correlation between social status and co-sleeping is not the same in South Asia and in the United States).

2. The components of a mentality (knowing, thinking, feeling, wanting, and valuing), such as feelings of closeness, pleasure, and serenity versus feelings of anxiety or agitation associated with skin-to-skin contact between parent and child, display significant variation across groups and differential patterning of within-group variation (e.g., European American males, in comparison to South Asian males, are more likely to feel anxiety associated with skin-to-skin contact between parent and child and feelings of closeness, pleasure, and serenity produced by skin-to-skin contact between parent and child may be correlated with gender in the United States, but not in South Asia).
3. The distribution of the practice appears to be related to the distribution of the mentality, and vice versa.

Thus, through the idea of a custom complex, cultural psychology joins the study of individual mental states to the study of cultural practices. On the one hand, investigators explore those features of what individuals know, think, feel, want, value, and hence choose to do that are primed by, traceable to, or derivable from participation in the symbolic forms, communicative exchanges, rituals, mores, folkways, and institutions of some consensus-sensitive or norm-enforcing group.

On the other hand, investigators look at the way in which the mentality-laden practices (the custom complexes) of particular groups gain their credibility, reasonableness, and motivational force from the very psychological states that they have helped activate and to which they have given life. Cultural psychology is therefore the study of reciprocal connections between culture and psyche and of the various patterns or forms of coherency (custom complexes) that have arisen out of their interactions.

CULTURAL PSYCHOLOGY'S THEORY OF MIND

On a worldwide scale, there is well-documented diversity in the developmentally relevant cultural practices that promote, sustain, and confirm what the "I's" of particular groups know, think, feel, want, value, and hence choose to do. Consequently, cultural psychology is concerned not only with the inherent, mandatory, or fundamental aspects of the human mind but also, indeed especially, with those parts of what people know, think, feel, want, value, and hence decide to do that are conditional, optional, or discretionary and are primed and activated through participation in the symbolic and behavioral inheritance of particular groups. In effect, cultural psychology is a discipline committed to the study of patterns of psychological difference across groups or subgroups and to the investigation of the emergence (and dissolution) of stable, relatively coherent, and intimate interconnections between cultural practices and individual mental states.

Any study of difference, however, presupposes many commonalities, likenesses, or universals by which attributions of difference become intelligible. A notable feature of our conception of cultural psychology is that it presupposes certain universal truths about what is (and what is not) inherent in human psychological functioning. At a minimum, we are committed to a theory of mind in which everywhere in the world human beings are the kind of beings who have a mental life (who know, think, and use language and other symbolic forms) and who feel, want, and value certain things, which is one way to explain what they do (Donagan, 1987).

Even more deeply, we are committed to the view that psyche consists of certain mental powers. Most notable of these are (a) the representational power to form beliefs about other persons, society, nature, the divine, and about means-ends connections of all sorts; and (b) the intentional power to affect an imagined future state of affairs by means of acts of the will, which is the human capacity to have a causal influence on the world through acts of decision making and choice.

If the power of representation is an essential feature of the human psyche, then the human psyche can be studied, at least in part, as a knowledge structure. If the power of intentionality is an essential feature of the human psyche, then the human psyche can be studied, at least in part, as inherently ends-sensitive, which is minimally what it means to be agentic or to have a free will.

This view of the inherent powers of the psyche accords reasonably well with William James's (1950) description of the marks of the "mental." According to James:

> The pursuance of future ends and the choice of means for their attainment are thus the mark and criterion of the presence of mentality in a phenomenon. We all use this test to distinguish between an intelligent and a mechanical performance. We impute no mentality to sticks and stones because they never seem to move for the sake of anything, but always when pushed and then indifferently and with no sign of choice. So we unhesitatingly call them senseless. . . . No

> actions but such as are done for an end, and show a choice of means, can be indubitable expressions of Mind. (p. 1)

As noted earlier the anthropological linguists Anna Wierzbicka (1986, 1991) and Cliff Goddard (1997, 2001) have shown that the notion of a mental subject or agent ("I") and mental state concepts such as to know, think, feel, want, and value (as good or bad) are lexicalized in all languages of the world and universally used in folk psychology to explain what people do. And it has been argued by Collingwood (1961, pp. 303, 306; see also Shweder et al., 1997), among many others, that at least one basic sense of the folk psychology concept of a "cause" is the idea of "a free and deliberate act of a conscious and responsible agent" that is best understood through the ends the agent is trying to achieve and the means the agent believes are available for achieving them. With respect to its picture of the component parts of a mentality, folk psychology and cultural psychology presuppose pretty much the same picture of the universal and inherent features of the human psyche. Those marks of the mental include representation, intentionality, knowing, thinking, feeling, wanting, valuing, and hence deciding to do something.

Although cultural psychology is primarily concerned with the emergence and development of psychic pluralism, it makes use of a restricted set of mental state concepts as a universal framework for understanding the organization of psychological differences between the "I's" of different groups. The nature and organization of such differences and the manner of their development are discussed in the following section.

CULTURAL PSYCHOLOGY'S SPECIAL USE OF MENTAL STATE CONCEPTS

In cultural psychology, mental state concepts are used to refer to the causal powers inherent in the mental nature of human beings. Such concepts are not necessarily meant to be descriptions of bits of human consciousness or of deliberative awareness.

One can use a mental state concept to explain what people do without necessarily assuming that the mental events in question are events in consciousness. What a person knows, thinks, wants, values is not always in front of that individual as a piece of awareness, even as it plays a causal role in how the person acts. How that causal process operates and produces its effects is a mystery that is at the heart of the unresolved (and perhaps irresolvable) mind-body or mind-brain problem. Not all types of explanation of human behavior assume that mind matters, in the sense of having causal effects on the body. Cultural psychology makes the assumption that mental states are real, not epiphenomenal.

This suggests one additional power inherent in the human psyche—the ability to translate or transform a self-conscious deliberative process into a routine, automatic, unconscious, or habitual process. This power to turn a slow calculative process into a rapid response process prepares the individual to respond skillfully, smoothly, and not self-consciously (indeed almost mindlessly) in particular ways in particular circumstances. When this translation or transformation is fully accomplished, the associated mentality comes to be intimate and seems to be implicit in the practice.

As J. W. M. Whiting and Child (1953) pointed out long ago, with respect to the beliefs implicit in a practice: "The performer of a practice does not necessarily consciously rehearse the belief to himself at each performance. [For example, a typical middle-class European American parent does not necessarily consciously think to herself or himself 'I know that I can promote autonomy and independence in infants and young children by having them sleep alone' every time she or he goes to bed at night.] If asked, however, she or he will generally be able to report immediately at least some of the associated beliefs; in this case one may surmise that rehearsal of the belief was not part of the stimulus pattern for the present performance of the custom but rather a significant part of the stimulus pattern earlier in the development of the custom" (p. 28).

This comment by J. W. M. Whiting and Child is important for two reasons. First, it highlights the developmental process of becoming unconscious, whereas most developmental theorists, from Vygotsky to Piaget to Kohlberg, privilege the developmental process of becoming conscious or reflective. Whiting's and Child's implication that much of social behavior is habitual and automatic and that social life would not be possible if this were not so accords well with the views of Bourdieu (1972, 1990, 1991), Packer (1987), and others who are concerned with the difference between participating in the world and consciously deliberating about it.

Bourdieu argues that as practices are repeated again and again, they come to be seen as part of a natural order, and their original explicit reasons for occurrence may be difficult to resurrect. Packer makes the point that development typically involves becoming more fluent at some activity and that this is not necessarily the

same as becoming more reflective about that activity (as any serious athlete surely knows; see also Keil, Chapter 14, this *Handbook,* Volume II).

The idea of the custom complex and the return of research interest to the study of routine or habitual practice is an invitation to rethink some basic and classical ideas about the nature of development (on the intellectual history of the idea of "habit" see Charles Camic, 1986). More needs to be said about the misguided idea that one can define progressive development as some standard formal criterion such as the shift from intuition to reflection or from context-boundedness to context-independence (Kessen, 1990).

One can add to the classical image of progressive directional change an indefinitely large series of other dichotomies. Somewhere or other in the vast literature on cognitive development, someone or other has argued that the fully developed mind is complex (versus simple), complete (versus incomplete), explicit (versus tacit), impersonal (versus personal), taxonomic (versus associative), elaborated (versus restricted), concept-driven (versus percept-driven), detached (versus affect-laden), consistent (versus inconsistent), and so on. As should be apparent from our discussion of the custom complex and the developmental advantages of tacit understandings, habits, and unreflective but fluent skills, cultural psychology is deeply suspicious of any attempt to define progressive development by universal (decontextualized) formal criteria. In some cases, cognitive development is the process of becoming less reflective not more reflective. Again, at times, the accumulation of tacit understanding is what intellectual growth is all about. It all depends.

The second reason for the importance of J. W. M. Whiting's and Child's (1953) comment is that it underscores the point that any adequate investigation into the cultural psychology of a person or a people—any description of a custom complex—must characterize the level of consciousness of the mentality that is associated with a particular cultural practice. Are the relevant beliefs, values, motives, and satisfactions active without deliberation, active because of deliberation, reportable reflections, unavailable to reflection, and so on? When it comes to participation in the custom complexes of any particular cultural community, to what extent is the course of development from the deliberate to the automatic, from the self-conscious to the fluent, or from the explicated to the tacitly understood? At the very least, the cultural psychology of development into the customary practices of any cultural community is likely to be the story of the progressive shift from deliberation and self-consciousness to mindless or intuitive fluency. It is a developmental story that has rarely been acknowledged in child development studies, except perhaps by those interested in the acquisition of physical skills such as walking down stairs, typing a letter, or hitting a golf ball.

SOCIAL DEVELOPMENT IN THE DIVERGENT INTERPERSONAL WORLDS OF CHILDHOOD

From the perspective of cultural psychology, the local world of the child—especially in those dimensions likely to affect behavioral and psychological development—is largely mediated through culture-specific mentalities and practices of child rearing. In documenting variations across populations, cultural psychology first considers how responsible caregivers and educators, with special attention to the local ideas and meanings that support their behavior, routinely organize the child's experience. If people think and act in the light of particular goals, values, and pictures of the world, what are the goals, values, and pictures of the world (the mentality) of members of different cultural communities? Are there any generalizations that can be made about how and why differences arise in children's worlds and how they are structured?

As portrayed in the anthropological literature, variations in childhood worlds across human populations can be roughly divided into three categories corresponding to the material, social, and cultural conditions for child development (R. A. LeVine, 1989). First, material conditions include diet, housing, infant holding devices, and forms of protection against disease and other health risks. Second, social conditions include the family, peer groups, and other aspects of the interpersonal environment. Third, cultural conditions refer to the local ideational models, combining beliefs and moral norms that give meaning to all features of the child's world as well as to the child's development.

The focus in this section is on interpersonal aspects of the child's world, as mediated by differing cultures throughout the world. A considerable body of evidence on this subject has accumulated over the past 35 years (since a review of the literature appearing in the third edition of the present work; see R. A. LeVine, 1970, and even more since Margaret Mead's review in the *Handbook's* first edition in 1931), permitting some generalizations about the range of variation in children's worlds and their

meanings. The interpersonal worlds of children from birth to adolescence in different cultural communities vary widely along dimensions that can be described in quantitative and qualitative terms and that indicate divergent pathways for behavioral and psychological development—particularly when analyzed from the perspectives of interactional theories of development.

First, we begin by describing how differing organizational settings, caregiving relationships, parental practices, and age-graded participation in activities provide divergent patterns of socially and symbolically mediated experience for children of different cultures. Second, we turn to the cultural mentalities that not only rationalize and legitimize these social patterns but also motivate parental behavior. Third, we consider to what extent culturally differentiated social experience during childhood affects the psychological development of individuals—their attachments, skills, competence, preferences, relationships, and emotional experience as adults. Finally, we attempt to generalize about universals and variations in social development and their implications for developmental theory and research.

THE SOCIAL ORGANIZATION OF CHILDHOOD EXPERIENCE

In this section we discuss the character and composition of domestic groups and variations in their function, size, density, boundedness.

Organizational Settings

For the first few years of life and often much longer, children in most societies are raised in domestic groups (the normal residential homes of the adults who care for them). The functions of these groups, and their size, composition, social density, and boundedness—all variable across cultures—influence the quantity and quality of social experience possible for a child in a given society. Many of these features, and the sociospatial arrangement of the family as a domestic group as a whole, are often not matters of personal choice but are standardized in local practice according to the dominant mode of economic production and prevailing ideas of morality.

The Function of Domestic Groups

In societies with domestic agricultural or craft production, where every family engages in productive work at home, children are raised in local settings designed for economic activities as well as for family residence. In urban-industrial societies like the United States, in which only 2% of adults engage in food production, children are more likely to be raised in home settings specifically designed for child care and segregated from adult economic activity.

This difference between cultural worlds in which work and family have been merged versus cultural worlds in which work and family have been separated (in some cases, as in the upper middle-class European American cultural area, with the family functioning more or less like a Montessori School) makes a great deal of difference for children. Where home is the setting for food or craft production, the attention of mothers is more often divided between child care and other demanding tasks. The family is then more likely to operate as a command hierarchy, with children at the bottom, and children are more likely to be spectators of a wide range of adult activities and to participate in them from an early age (Rogoff, Mistry, Göncü, & Mosier, 1993). A family that functions as an economic production unit, like that of many Third World people today and preindustrial Europe and North America, constitutes a distinctive world of childhood in which child labor is expected and children's play and education must be accommodated to the workplaces and routines of the home.

The actual amount of children's labor contributions in such families varies from one agricultural people to another (Nag, White, & Peet, 1978). Among those with low-level technology, like the peoples of sub-Saharan Africa, children may have to work a great deal at tasks they can do such as fetching water, herding animals, caring for babies, and assisting in cultivation. This permits the adults to concentrate on the heavier or more skilled tasks of hoeing, planting, weeding, harvesting, and food processing. Among peoples with a higher level of agricultural technology including irrigation, draft animals, and plows (e.g., rural villagers of India), the need for domestic labor is less and children may be indulged and have more free time. The actual utility of child labor in a particular setting, however, depends on the specific crops cultivated, their seasonal cycles, the availability of resources, such as water, and whether children can be hired outside the family. When new technology is introduced, the situation changes, and children may be freed from labor, unless they are drafted into craft production at home or sent elsewhere as hired hands.

In foraging (i.e., hunting-gathering) and fishing communities and among pastoral nomads, children also participate in productive activities at early ages (by the

standards of contemporary industrialized societies), but the degree to which they are confined or free to play in the course of the day and the year varies with the rhythm of the work cycle. Similar to agricultural communities, domestic economic production largely determines the functional world of children's social lives.

The Size of Domestic Groups

The number of persons coresiding in domestic units is extremely variable among human societies, and although some of this variation depends on the definition of the unit, it is certain that the nuclear family household of Europe and North America is among the smallest in the world. Anthropologists have reported large domestic groups (up to and more than a hundred) under a single roof or surrounded by a single wall in places as diverse as New Guinea, lowland South America, West Africa, and indigenous North America: Although such groups have internal social boundaries, they certainly provide a child of any age with opportunities for interacting with many and diverse persons most of the time.

This is also true, in a more limited way, of societies with extended or joint family structures in which the domestic unit encompasses two or more nuclear families of two or more generations. B. B. Whiting and Whiting (1975) pointed out that when adult women share cooking facilities and yard space, they are more likely to interact with each other's children and cooperate in child care. The joint families of India are an example, as are the large compounds of the Yoruba of southwestern Nigeria, the smaller compounds of the Giriama of coastal Kenya (Wenger, 1989), and the Hausa of northwestern Nigeria (R. A. LeVine, LeVine, Iwanaga, & Marvin, 1970; Marvin, VanDevender, Iwanaga, LeVine, & LeVine, 1977). In all these environments, the sheer size of the domestic group guarantees that the child will interact with a large number of women and children from infancy onward.

The Composition of Domestic Groups

In contemporary urban-industrial societies, the domestic group is coterminous with the household, and composition of households with children can usually be classified by whether one or both parents reside there and whether there are other adults such as grandparents. It is more complicated among agrarian and other nonindustrial societies in which households as physical structures can be situated in larger domestic units usually referred to as compounds or homesteads by anthropologists.

Among the Gusii of southwestern Kenya, a married woman and her younger children live in a house by themselves, but it is a unit embedded in a homestead owned by her husband or father-in-law, along with the (nearby) houses of her parents-in-law, brothers-in-law, and co-wives. If her husband is a polygamist, he may live in the houses of his other wives all or part of the time or even in a hut of his own separate from all of them, though near enough for children to bring him hot food from their houses.

Furthermore, as the children get older, they leave the mother's house to sleep in the house of an older brother (for boys) or a grandmother (for girls), all within the homestead. The Gusii mother-child household is the elementary unit of family residence, but the homestead is the basic unit of domestic social life from the viewpoint of adults, and its male members form the nucleus of a local patrilineage (R. A. LeVine et al., 1994; R. A. LeVine & LeVine, 1966). This complex composition of domestic groups is common to many nonindustrial societies and often means that the child grows up in a more complex residential environment than that of the average American child.

The Social Density of Domestic Groups

The interactive settings in which children spend their early lives—including those of eating, sleeping, work, and play—vary widely in social density across cultures regardless of the size and compositional complexity of domestic groups. Gusii children may grow up in a homestead with as many as 58 inhabitants but spend all their hours in and around their mother's house, interacting only with mother and older siblings during the preschool years.

In contrast, Hausa children, in a much smaller compound, may experience greater social density because the sharing of cooking facilities and yard space among the Hausa women in a walled compound creates more crowded settings for daily interaction involving children. The social density a child experiences, especially during the less mobile early years of life, depends not only on the wealth or resources of the family but also on the rules that govern family interaction. It seems hard for Americans and Europeans to believe that people in other cultures may enjoy, indeed prefer, crowded settings in which to eat, sleep, work, play, and even breastfeed babies (Tronick, Morelli, & Winn, 1987), but such preferences are widespread among the world's peoples, even when they have enough domestic space in which to carry on these activities in isolation.

The Boundedness of Domestic Groups

Interactive patterns in the child's world are constrained by the social boundaries recognized by adults. Boundaries can be physical in form, like the mud walls of a Yoruba or Hausa compound or the cultivated fields that divide the mother-child households of a Gusii homestead from each other. Boundaries can also be invisible or conceptual barriers, as in the local traditions of interhousehold visiting, greeting, and hospitality that limit the interaction of children and adults in many Western and Japanese urban neighborhoods.

In urban India, by contrast, there are middle-class apartment dwellings occupied by kin-related families whose children wander in and out of each other's homes without such restriction. From the children's perspective, the permeability of the household and other domestic units in the immediate environment provides the basis of a cognitive map of their social world.

Care-Giving Relationships

Mothers are the primary caregivers of their children for at least the first 2 years of life in most human societies, but there are significant exceptions, and there is even greater variation in the array of supplementary caregivers who assist mothers and form relationships with young children. The ethnographic record as a whole does not suggest that there is a single system for human child care but rather a range of parental patterns flexible enough to respond to and enable varying economic, demographic, and technological conditions with diverse care-giving arrangements that affect the interpersonal experience of the growing child.

When women have a heavy workload due to a primary role in food production, then the resultant scarcity of female labor may create a demand for supplementary caregiving arrangements. When children are scarce relative to adult women (due to high rates of infertility, infant and child mortality, or contraception), adult women who are infertile or postmenopausal may be eager to take care of young children born to others. When wet nurses or synthetic milk formulas become available, maternal breast-feeding may decline. Thus, variations in caregiving practices and relationships are generated by the differing conditions to which human populations adapt.

There are some human populations in which a majority of children under 2 years of age live with and are cared for by someone other than their mothers. These fostering and adoption practices have been documented in Micronesia (Carroll, 1970) and West Africa (Bledsoe, 1989). In these cases, young children are distributed among kin, often to mothers and sisters of the women who gave birth to them, after a period of breast-feeding by the mother. There is usually no effort to disguise the original relationship, and children often go back to their mothers after a period of years. Although some mothers do this because they feel obliged to meet the demands of their own mothers or sisters, they usually also feel that the child will benefit from additional sponsorship, as Goody (1982) has described for the fostering of older children among the Gonja of Ghana. All these practices are infused with the assumptions of a kinship ideology in which children are seen as belonging to, and as potential beneficiaries of, a descent group wider than the biological parents. Mothers who do not care for their own children are not viewed as irresponsible or neglectful in these cultural communities.

In a much larger range of societies, children are raised by their mothers, though often with help from others such as sibling caregivers, grandmothers and other related adult women, and fathers or other men.

Sibling care of infants is widespread not only in sub-Saharan Africa (where it is ubiquitous) but also in Oceania, Okinawa, and parts of Southeast Asia (Weisner, 1982, 1987, 1989a, 1989b; Weisner & Gallimore, 1977). It is more frequent where mothers have extensive responsibility for agriculture.

The practice of sibling caretaking raises the question of whether leaving infants in the care of 5- to 10-year-old children, which would be considered criminal neglect in the United States, harms babies when it has achieved the status of a custom complex and is the routine practice of an entire population.

From the available evidence, the answer to this question is: No, babies are not harmed by this practice. For several reasons, first, 5-year-old children can be, and are, trained to be responsibly protective, if not necessarily sensitive, caregivers, particularly for babies carried on the back. Second, child care is largely conducted in the open air during the day, and neighbors are within earshot in case anything goes wrong. Third, the child nurse is not expected to substitute for the mother in a general sense, but simply to complement her care by protecting and feeding the baby for a few hours at a time. The mother breast-feeds during the day and sleeps with the baby at night, and infants raised under these conditions become attached to their mothers.

Finally, and in light of the foregoing, it seems that the American or European American concern about psychological harm is probably exaggerated. Babies can accommodate comfortably to sibling care, and back-carrying as well as other widespread forms of tactile stimulation promote both physical growth and psychosocial attachment during the 1st year (R. A. LeVine et al., 1994, pp. 257–258).

Furthermore, sibling care can initiate a strong lifelong relationship between an older sister and younger brother, which some cultures selectively promote. Among the Hausa, the marriage of a sister's son to the daughter of the brother she cared for as an infant is a preferred form of cross-cousin marriage. Even in the short run, the relationship of the toddler to his sibling caregiver often introduces the child to a larger group of children who become salient nonparental figures in his life.

Grandmothers and other adult women often play an important supplementary role in infant care, especially where children are raised in large domestic groups. From West Africa to India and China, grandmothers are not only caregivers in the early years but also, as the child grows older, complements to the mother's disciplinary role with their unconditional nurturance and emotional support. Children can, and often do, form intense and long-lasting relationships with other resident women in extended family situations.

Fathers and other men are more rarely observed as caregivers for young children, but there is variation across human populations. Hewlett (1992) has provided substantial data from diverse peoples. He distinguishes between the father's investment in the child, which may be indirect and consist of providing resources through the mother, and involvement with the child, which refers to interaction.

Although paternal interaction with young children is rare relative to that of the mother and other females, and it is unusual cross-culturally for males to be constant and responsible caregivers (as opposed to occasional playmates) for infants or toddlers, the range is quite considerable. Among the Dinka of the Sudan, for example, the exclusion of men from attending the delivery of a child is extended through the early years of a child's life, and the father only interacts with his older children (Deng, 1972). Aka pygmy fathers in Cameroon, however, participate substantially in the care of young children (Hewlett, 1991), and among high-caste Hindu farmers of the Katmandu Valley in Nepal, various men in the extended family take care of infants and toddlers for periods of time during the day (S. LeVine, n.d.). As Harkness and Super (1992) point out, fathers can be in the presence of young children without interacting with them, and it is only when cultural practices and mentalities favor it, that fathers and other men will assume responsibility for the care of children or engage them in interaction. Infants become attached to their father and other men who interact with them, as they do to their mother, siblings, grandmothers, and other adult women (Ainsworth, 1967).

Parental Practices

An important and culturally variable part of the child's social environment is constituted by the customary activities that parents and others arrange for them. Observational investigators of human and other primate offspring have created a number of dichotomous categories to describe these activities: Child-centered communications versus those that do not include the child, distal (often verbal) versus proximal (usually physical) stimulations, reciprocal or contingent vocalization versus unilateral speech to a child, positive versus negative emotional arousal, soothing versus stimulation, and sensitive versus insensitive response to infant signals.

These dichotomies are behaviorally specified to be unequivocally observable in differing contexts of primate behavior, but they nevertheless seem to reflect European American middle-class preferences for child-centered, distal, verbal, reciprocal, emotionally positive, stimulating, and sensitive patterns of parent-child interaction. Studies using these categories cross-culturally usually show that parents in other cultures exhibit some or all of these behaviors less frequently than middle-class European Americans (R. A. LeVine et al., 1994; Richman et al., 1988; Richman, Miller, & LeVine, 1992).

However valid these findings of difference in frequencies may be, they are only part of the story. Taking European American custom complexes as the reference point for comparison almost inevitably means overlooking activities and dimensions that are salient only in the other cultures. Without a complementary account of the mentality and point of view of the other culture, this is grossly uninformative, like an African account that might describe the American family as lacking cattle and agriculture.

The findings may indicate that parents in the other culture are not committed to the same custom complex

in their observable practices and do not share the European American mentality, but the findings do not describe what custom complex they are committed to and what goals, values, and pictures of the world they are in fact and in practice following. To make sense of observable differences in parents' practices, it is necessary to describe the parents' cultural models of social relations. It is necessary to describe the mentalities that guide and give meaning to their practices and to a child's social participation. Some illustrations are provided in the next section.

Age-Graded Activities

In all societies, the social interaction of children is altered by their age-related participation in activities at home or school. The institution of schooling creates an extreme form of age-grading. In most schools children, from the ages of 5- to 8-years-old onward, tend to be rigidly segregated by age from those older and younger for many of their daytime activities.

The peer groups that result are neither natural nor universal. In societies without schools, children's relationships with each other are formed among siblings or other multiage groups of juveniles (Konner, 1975). In these multiage groups, participants are much more sharply differentiated by authority and knowledge than in school-based peer groups. In such groups, relationships among older and younger children may facilitate the learning of skills by the younger, who observe mature practice performed by someone old enough to be more skilled but close enough in age to be easily imitated (Dunn, 1983).

Sibling relations may also promote interpersonal responsibility, cooperation, and sensitivity to the vulnerability of others on the part of the elder children (Schieffelin, 1990; Weisner, 1982, 1987, 1989b; B. B. Whiting & Edwards, 1988). Schools, alternatively, may foster interpersonal comparison and competition among peers and, by obstructing the child's observational access to mature practice, make learning more problematic and hence more self-conscious (Lave, 1990; R. A. LeVine, 1978; Scribner & Cole, 1973). Cultural variability in age-graded social activities is widened further by specific combinations of siblings, school and work in the local environments of children, and culture-specific norms that elaborate or diminish age ranking.

CULTURAL MENTALITIES CONCERNING CHILDHOOD SOCIAL RELATIONS

Parents do not always try to control the interpersonal environments of their children in detail, particularly after the first 2 or 3 years, and when they try to, they are often far from successful. Nevertheless, parents care about and can usually influence the settings in which their children interact with others, their caregivers and companions, and the kinds of interactions that take place (B. B. Whiting & Edwards, 1988; B. B. Whiting & Whiting, 1975). Thus, it matters what parents think and feel about such things, and socially inherited beliefs, values, and pictures of the world frame what they think and feel. Parents are culture bearers, and their models of childhood social relations are as variable as their culture's conceptions of the good life and how to live it (Harkness & Super, 1996; R. A. LeVine et al., 1994; R. A. LeVine, Miller, & West, 1988).

Parental Models and Strategies

Parental behavior is symbolic action in Geertz's (1973b) sense of the term and reflects a local mentality about what parenthood and child development are and ought to be, as formulated in the symbols of a particular culture. The local cultural mentality gives meaning to the actions of parents and children and motivates parents to promote certain behaviors and dampen others. A cultural mentality of child care has three components: (1) moral direction, (2) a pragmatic design, and (3) customary scripts for interaction (R. A. LeVine et al., 1994).

Moral Direction

Cultural mentalities of child care are goal driven; they are formulated by cultural concepts of virtue toward which a child's behavioral development should move. The vernacular words (e.g., independence, autonomy, and self-reliance for the European American middle class) and the images associated with them that represent virtuous goals of development help provide parents' rationales for their observable child-care practices.

Research on comparative ethics and development, however, has revealed that the humanly recognizable virtues or moral ends of life can be culturally organized in ways that do not privilege an "ethics of autonomy" (Haidt et al., 1993; Jensen, 1996, 2005; Shweder, 1990b;

Shweder et al., 1990, 1997) and that in some societies an "ethics of community" and/or an "ethics of divinity" leads to an emphasis on alternative virtues and goals of development such as duty, respect, hierarchical interdependency, purity, and sanctity.

Furthermore, each type of ethics highlights a particular view of the self. Shweder et al. (1997) argue that (a) the ethics of autonomy is associated with a conception of the self as an individual preference structure, where the point of moral evaluation is to increase choice and personal liberty; (b) the ethics of community is associated with a conception of the self as an office holder in which a person's role or station in life is intrinsic to their identity; and (c) the ethics of divinity is associated with a conception of the self as a spiritual entity connected to some sacred order of things and as the bearer of a legacy that is elevated and pure. The meaning of child-care practices in any particular community, from disciplinary practices to sleeping arrangements to the practice of circumcision, is often most understandable with reference to the particular moral ends that justify and rationalize those practices in the minds of parents in that local cultural world (on initiation and circumcision see, e.g., Kratz, 1994, pp. 341–347).

Pragmatic Design

Cultural mentalities of child care embody strategies not only for facilitating the child's behavioral development in a morally virtuous direction but also for achieving other ends (e.g., survival, health, and economic returns) and for overcoming obstacles to the attainment of all these ends. This utilitarian aspect of child-care mentalities provides a practical value and convinces parents that they are doing what is necessary and right.

Customary Scripts for Interaction

The moral and pragmatic aspects of a child-care mentality may or may not be explicitly formulated in general terms, but they are always represented in the social customs that guide the interaction of parents and other caregivers with young and older children. At this level of specificity in social interaction, for example, the script for responding to a baby's cry among the Gusii of Kenya is an immediate soothing response. This response is seen as promoting the calmness and compliance of a young child (the moral direction) as well as the child's health and survival in the early months (part of the pragmatic design). However, it is so customary that allowing a baby to cry more than a few seconds is experienced by Gusii adults as an intolerable breach of caregiving norms.

THE EFFECTS OF EARLY INTERPERSONAL EXPERIENCE

What effects do cultural variations in interpersonal environments and symbolically mediated experience have on the behavioral and psychosocial development of the child? A cultural community or population-level approach provides a clearer picture of the effects of early experience than a focus on the psychology of individual differences (R. A. LeVine, 1990a). For example, children who grow up in China obviously learn to speak Chinese, just as those who grow up in Turkey learn Turkish. Less obvious, but well established by sociolinguistic investigators of child language, is that as young children acquire a first language they also master the communicative practices regulating interpersonal behavior in their communities (Ochs & Schieffelin, 1984; Schieffelin & Ochs, 1986a, 1986b).

The symbolic mediation of experience and communicative practices are discussed in a following section. The main point of emphasis here is a very simple one: For young children the development of communicative competence reflects their early experience in a particular language environment and constitutes an important part of their early enculturation.

By age 3, children have culture-specific capacities for and expectations of emotionally salient interpersonal behavior, embedded in speech routines and other customs of face-to-face interaction, in the context of specific relationships (Schieffelin, 1990). Their behavioral development has taken a culturally distinctive character and direction, diverging from that of other cultures.

Relatively little research has been done on the behavioral consequences of cultural variations in early social experience, but there is some evidence of measurable effects. Social behaviors shown to differ across culturally varying samples of children include infant-mother attachment (Grossmann & Grossmann, 1981, 1991; Grossmann, Grossmann, Spangler, Suess, & Unzner, 1985), attention-seeking (R. A. LeVine et al., 1994; B. B. Whiting & Whiting, 1975), dependence (Caudill & Schooler, 1973), cooperation (Thomas, 1978), and gender orientation (B. B. Whiting & Edwards, 1988). In each of these cases, the evidence of

behavioral difference has been interpreted by the investigators to reflect the impact of the children's prior experience in divergent cultural environments, although it is probably not possible at this time to choose between different interpretations of this impact (e.g., facilitation, attunement, or maintenance/loss, as discussed earlier; Werker, 1989).

An example from infancy research is the Grossmanns' (1981, 1991; Grossmann et al., 1985) study of infant-mother attachment in Bielefeld, North Germany. This German replication of Mary Ainsworth's Baltimore study (Ainsworth, Blehar, Waters, & Wall, 1978) found that the majority of a nonclinical sample of 12-month-olds was classifiable on the basis of the videotaped Strange Situation as "insecurely" attached to their mothers. Forty-nine percent of the sample was classified in the "A" category or "anxious-avoidant," almost twice as large a proportion as in American samples. The Grossmanns related this departure from American norms to the German mothers' custom complex—their mentality and practices. German mothers, in this region of Germany, prefer a greater physical and interpersonal distance from their infants than Americans, leaving them alone more often and sometimes pushing them away. They would consider American infants rated as "optimal" by attachment researchers to be spoiled.

According to the Grossmanns' interpretation, the culture-specific preferences of the German mothers was based on a broader cultural mentality, even ideology, emphasizing an ideal of pure independence that is even more exaggerated than the European American ethics of autonomy. For these mothers, this cultural ideology was translated into maternal practices that affected not only their infants' routine expectations for social interaction and comforting but also their response to separation and reunion in the Strange Situation. Their interpretation of their findings implies, though the Grossmanns do not say so, that the profile of attachment ratings of American infants in the Strange Situation can be seen as reflecting the culturally influenced parental practices of European Americans rather than a universal norm for all human populations (LeVine & Norman, 2001).

If this is so, then claims of species-typical universality for attachment as observed in the Strange Situation should be considered premature. Infant reactions to reunion with their mother after a brief separation at 12 months of age can be reinterpreted as indicators of early enculturation to a cultural standard of interpersonal distance mediated through parental practices of infant care.

The German evidence provides the starting point for a cultural critique of the Bowlby-Ainsworth model of attachment, especially its claims to have discovered the evolutionary origins of human social relationships and the biological basis for judgments of optimality, normality, and pathology in early development. As more detailed and culturally informed evidence on behavioral development in diverse cultures accumulates, a cultural critique of developmental models may serve a useful purpose, particularly if the models themselves continue to ignore cultural variation in early social experience.

At this point, it may not be possible to launch robust generalizations about the psychological effects of early interpersonal experience based on population-level comparisons across cultures. However, as the concepts and techniques for observing and recording infant care and early communicative exchanges involving children have improved, and as comparative evidence has grown, so have the grounds for believing human behavioral development to be culturally divergent from the early years of childhood onward.

THE SYMBOLIC MEDIATION OF EXPERIENCE: LANGUAGE AND COMMUNICATIVE CUSTOMS IN CULTURAL PSYCHOLOGY

It is a major assumption of cultural psychology that one mind is transformed into many mentalities through the symbolic mediation of experience and that the human conceptual capacities that support culture also support language use, which is the primary means by which the symbolic and behavioral inheritances of a cultural tradition are passed on to the next generation. It is primarily by means of language that human beings negotiate divergent points of view and construct shared cultural realities. In this section, we selectively discuss the role of certain pragmatic forms of linguistic analysis in research on the cultural psychology of development.

As children learn language, they gain entry to existing meaning systems and access to the tools for recreating and transforming those systems. In a wide-ranging review of the literature, Nelson (1996) concludes "language and the surrounding culture take over the human mind" (p. 325), profoundly changing the nature of cognition and communication during the time from 2 to 6 years of age. Language is fundamental not only to meaning construction but to identity. Through its association

with particular contexts, language comes to symbolize and belong to particular groups. Quite simply, there can be no cultural psychology without language.

This premise is traceable to many intellectual forebears of contemporary cultural psychology. These include the eighteenth-century European philosophers who laid the groundwork for cultural psychology (Jahoda, 1992), Wilhelm Wundt and other nineteenth-century proponents of a "second" psychology (Cahan & White, 1992), and Edward Sapir (Mandelbaum, 1951) the anthropological linguist whose works on language in social life and on culture and personality anticipated many topics of current interest to cultural psychologists.

We begin this section of the chapter by discussing the conception of language that is most compatible with the aims of cultural psychology and by identifying resources from allied fields of study that hold promise for deepening our understanding of language in cultural life. We turn next to socialization, one of the fundamental problems of cultural psychology, and review studies that have yielded important insights into the actual process of socialization by examining the forms and functions of everyday discourse. We then single out oral narrative as a paradigm case of everyday discourse, organizing the discussion around issues of diversity. Throughout this section, the primary focus is on research with young children. In keeping with the comparative commitment of cultural psychology, examples of variation within and across cultures are included wherever possible.

LANGUAGE AS PRACTICE

The centrality of language to cultural psychology stems not only from historical precedent but also from the duality of language. Unlike other domains, language is both a tool and an object of inquiry. On the one hand, the use of language as an instrument of inquiry is pervasive; every study of human development depends on verbal communication in one way or another. Children are questioned about the reasons for their moral judgments. Parents are interviewed about their child-rearing beliefs. Verbal behaviors are incorporated into observational coding schemes. Experimental tasks have to be explained to participants. On the other hand, language serves as the object of inquiry in many studies that seek to understand the nature and development of the linguistic system itself, including its various subsystems (e.g., syntax, morphology).

This distinction between language as tool and object of inquiry serves the interests of cultural psychology by promoting critical examination of the ways in which researchers use language in conducting their research and by acknowledging the continued importance of understanding the referential function of language. At the same time, this distinction is limiting because it does not readily encompass a third, rapidly growing set of studies of particular interest to cultural psychology.

These studies focus on talk but they are not concerned with language development itself. Instead, they examine how talk contributes to constituting children's experience in other developmental domains (Garvey, 1992) such as social development (e.g., Dunn, 1993), self construction (e.g., Bruner, 1990a, 1990b), and peer culture (e.g., Corsaro, 1992, 1997). These studies take talk seriously as a "substantive, structured, and structuring activity with intrinsic developmental significance" (Packer, 1987, p. 253). An important implication of this perspective is that a particular social phenomenon may be constituted in qualitatively different ways within and across cultures and that these differences are created partly through talk.

Recent research on play deserves to be singled out because it illustrates this point especially well and because it represents some of the most richly contextualized research in developmental cultural psychology. Children use verbal and nonverbal means to frame their play as nonliteral, to enact pretend roles, and to negotiate pretend transformations with their play partners (e.g., Garvey & Kramer, 1989; Sawyer, 1997). However, local customs and belief systems vary dramatically along many dimensions, including who children play with and how they communicate with one another (e.g., C. D. Clark, 2003; Göncü, 1999; Göncü, Patt, & Kouba, 2002; Haight, Wang, Fung, Williams, & Mintz, 1999; Lancy, 1996; Schwartzman, 1978). For example, when a child has long conversations with an invisible other, middle-class American parents are likely to assume that she is talking to an imaginary companion; Hindu parents that she is talking to a real spiritual being (M. Taylor & Carlson, 2000). In contrast to middle-class European American children, whose mothers induct them into pretense by prompting, elaborating, and modeling (Haight & Miller, 1993), Yucatec Mayan parents do not play with young children (Gaskins, 1999). When Mayan children engage in social pretense, they do so exclusively with other children. Similarly, Indonesian and Mexican children are socialized into play by older siblings

(Farver, 1999). Although children in all these groups engage in pretend play, they do so according to local social and communicative conventions. As a result, play assumes different forms, takes on different significances, and likely makes different contributions to their overall development.

Implicit in these studies is a conception of language that privileges the situated use of language and recognizes that speaking is inherently polysemous when extracted from context (Bauman & Sherzer, 1989; Duranti & Goodwin, 1992; Hanks, 1996). This conception contrasts with the narrowly referential conception of language that holds sway in most research on human development and cross-cultural psychology. The view of language that is most compatible with the aims of cultural psychology does not reduce language to a representational system or repository of knowledge. Rather, it goes beyond grammatical and lexical meaning to include processes of indexical meaning that anchor utterances to their linguistic and nonlinguistic contexts and to unspoken background assumptions.

Hanks (1996) describes speech as "a form of engagement in the world. . . .To speak is to occupy the world, not only to represent it, and this occupancy entails various modes of expression, of which propositional meaning is only one" (p. 236). To speak is to create social realities—to play, tease, instruct, dominate, transform oneself, and so on. Just as language cannot be sealed off from social life, words cannot be sealed off from silence or from gaze, posture, gesture, facial expression, and other practices of the body. From this perspective, speaking consists of practices that are organized beyond the sentence level into dialogues, genres, and multichanneled performances. These larger communicative events, while serving as units of analysis, are themselves multiply embedded in larger sociocultural contexts and networks of cultural practices. In contrast to approaches that take the disembodied word, sentence, or text as the unit of analysis, this approach permits a deeper cultural analysis, for it recognizes that cultural principles are expressed not just in the content of talk but in the way that discourse is organized internally and in relation to larger events and sequences of talk.

Among the many intellectual currents that have fed into practiced-centered views of language is sociohistorical theory, with its focus on semiotically mediated activity (Cole, 1996; Wertsch, 1985) and linguistic anthropology, especially the fields of ethnography of communication (e.g., Bauman & Sherzer, 1989; Hymes, 1974) and language socialization (which is discussed more fully later). These fields have been centrally concerned with cross-cultural comparisons and hence are especially germane to the comparative mission of cultural psychology. Resting on the assumption that everyday talk is a pervasive, orderly, and culturally organized feature of social life in every culture, they seek to understand the diversity of language use in the conduct and constitution of social life.

These fields provide a rich set of conceptual, methodological, and empirical resources that cultural psychologists should exploit more fully. These include procedures for grounding interpretations of communicative practices in the public cues that participants systematically deploy in interaction and critiques of our own social scientific methods as communicative practices whose meaning may not be shared by the people we study. For example, C. Briggs' (1986) analysis of interviewing as a social and cultural practice is still timely and demonstrates the critical importance of customizing interviewing to local metacommunicative practices (see also P. J. Miller et al., 2003, for an application of this approach).

Another important insight from these fields pertains to the issue of context. The focus on naturally occurring discursive practices has led to a much more dynamic conception of context and practice than is usually assumed in developmental studies. Contexts are treated not as static givens, dictated by the social and physical environment, but as ongoing accomplishments negotiated by participants. This shift from static to dynamic is signaled by the term *contextualization,* which focuses attention on the interpretive processes participants themselves use to determine which aspects of the ongoing activity are relevant (e.g., Bauman & Briggs, 1990; Duranti & Goodwin, 1992). This conceptual innovation offers a holistic conception of individual and context as an interlocking system in which the language practice changes along with the person (see Goodnow et al., 1995, for further discussion of this point).

SOCIALIZATION THROUGH LANGUAGE

The growing literature on language socialization deserves further consideration because it arises from an intellectual project that is basic to cultural psychology. Cultural psychology recognizes that child development is inextricably bound to the process of socialization—of orienting oneself in systems of meaning—and seeks to understand the nature of this process as it is actually en-

acted by living, experiencing human beings. Cultural psychology is uniquely positioned, by virtue of its interdisciplinary character and commitment to meaning, to claim socialization fully as its own—something that none of the social sciences has succeeded in doing. Because of the way in which human action has been partitioned for study, socialization has remained marginal to the intellectual agenda of any discipline. As a result, it has been difficult to devise an integrated conception of socialization that slights neither culture nor children.

The field of language socialization provides an important model of how to proceed with this task. Inspired by Edward Sapir's famous words, "Language is a great force of socialization, probably the greatest that exists" (Mandelbaum, 1951, p. 15), this field rests on the premise that children are not only socialized through language but are socialized to use language (Ochs & Schieffelin, 1984). Another touchstone is the Vygotskian idea that sociocultural meanings are created by using language for particular purposes in socially defined activities (Vygotsky, 1934/1987; Wertsch, 1985). If language not only reflects meaning but also constitutes meaning, then an adequate theory of socialization must incorporate talk in a principled way.

Such a theory confers three advantages. First, the actual processes of socialization are rendered accessible through analysis of the forms and functions of everyday discourse. Second, in keeping with a basic insight of modern developmental psychology, the child is accorded an active role through a focus on child and caregivers' mutual, negotiated participation in discourse practices (Brandtstädter, Chapter 10, this *Handbook,* this volume; Rogoff, 1990). Third, the fact that language practices systematically index social statuses and ideologies helps to explain the varied affective stances—eager acceptance, resistance, playfulness—that children assume as they attempt to invest cultural resources with meaning (Watson-Gegeo & Gegeo, 1999). Both the nonneutral, ideologically charged nature of the socializing environment and the necessarily evaluative responses of the child-in-context are taken into account (Goodnow, 1990a).

Beginning in the 1970s, led by the pioneering work of Ochs and Schieffelin (1984), researchers began to translate these ideas into a particular kind of empirical work designed to link macro- and microlevels of analysis. In an attempt to discover how communities structure children's entry into meaning, they combined ethnographic fieldwork with the meticulous documentation of interactions between members and novices as they unfold in everyday life. Although the process of language socialization was assumed to be lifelong, most research focused on the early years. In contrast to many domains of human development, some of the best documented cases were non-Western cultures (e.g., Ochs, 1988; Schieffelin, 1990; Watson-Gegeo & Gegeo, 1990, 1999) and working-class and minority groups in the United States (e.g., Heath, 1983; P. J. Miller, 1982).

Research on language socialization has been the subject of numerous reviews (e.g., P. J. Miller & Hoogstra, 1992; Schieffelin & Ochs, 1986a) and collections (e.g., Bayley & Schecter, 2003; Corsaro & Miller, 1992; Schieffelin & Ochs, 1986b). An important conclusion emerging from this body of work is that there is enormous diversity in the cultural organization of caregiving and language learning and that the pattern of sustained dyadic conversation and mutual negotiation of meaning so familiar to many middle-class European Americans is but one variant among many. As noted earlier, groups differ in the physical and social ecology of child care, in language ideologies and folk theories about the nature of children and development, in the practices used to encourage mature speech, and in the principles that organize interaction.

For example, Kaluli mothers of Papua, New Guinea, believe that infants do not understand and thus cannot be conversational partners (Schieffelin, 1990). They do not talk *to* infants; instead they face babies outwards so that they can be part of the social flow. When older siblings greet the baby, the mother speaks *for* the baby, using language that is appropriate to the older child. Mothers do not interpret or paraphrase infants' vocalizations, a practice that reflects a dispreference for talking about another person's thoughts or feelings. In the working-class African American community described by Heath (1983), multiparty talk is the norm and children are almost never alone. Talk around the child, rather than talk directly to the child, is the primary linguistic resource for novice learners. In a Mayan community in southern Mexico, both dyadic and "eavesdropper" models of language learning are practiced, and nonverbal interaction plays an important role in organizing infants' participation (de León, 2000).

Coexisting with these and other differences are important similarities. For example, many groups socialize children into elaborate forms of teasing and oppositional language (e.g., Briggs, 1998; Corsaro, Molinari, & Rosier, 2002; de León, 2000; Eisenberg, 1986). Even more widespread is the use of explicit instruction to socialize young children into valued ways of acting, feeling,

and speaking (P. J. Miller & Hoogstra, 1992). This is one of the reasons we could suggest (in our initial discussion of the custom complex) that the course of progressive development is sometimes from the reflective to the unreflective, from the explicit to the tacit. For example, Watson-Gegeo and Gegeo (1990), found that Kwara'ae (Solomon Islands) parents used a symbolically powerful and emotionally intense discourse, called "shaping the mind," to pass on traditional knowledge and encourage children to practice reasoning and argumentation.

Research on language socialization also has revealed that many of the most powerful socializing messages are implicit and unintended. They are conveyed through tacit routine organizations of time and space, with their associated routines and distributions of social actors, and through contrastive distributions of language forms and functions that index meaning. The implication is that research that depends exclusively on asking caregivers about their socializing goals is likely to miss some of the deepest and most subtle dimensions of socialization—those pervasive and fundamental cultural orderings that feel most deeply natural to participants and are least likely to be reflected on. For example, Western Samoan children begin to learn about the social stratification that pervades their society not only by participating in interactions in which higher status caregivers direct lower status caregivers to care for them but also by observing how caregivers of different rank distribute themselves in domestic spaces (Ochs, 1988).

In addition to establishing that there are diverse pathways to communicative competence, studies of language socialization also demonstrate that children come to embody diverse ways of being in the world. Particularly relevant to cultural psychology are studies that focus on the socialization of affect. Like earlier work (e.g., P. J. Miller & Sperry, 1987; Schieffelin & Ochs, 1986a, 1986b), recent studies show that children are able to express affect through customary communicative means from an early age and that they deploy a wide variety of communicative resources, not just emotion state terms (e.g., Clancy, 1999). Some studies focus on caregivers' styles of affective socialization (e.g., Cervantes, 2002). Others show how culturally salient affective experience—for example, shame for Taiwanese children (Fung, 1999), interpersonal danger for Inuit children (J. Briggs, 1998)—is constituted through children's habitual participation in recurring patterns of discourse.

Welcome as such evidence is for developmental cultural psychology, the project of mapping a landscape of cultural distinctiveness carries with it certain risks. One of the unintended consequences of the first phase of research on language socialization was to essentialize differences across cultures, minimizing variation within culture and across time (Ochs, 1999). Fortunately, an emerging trend in recent research on language socialization is a focus on bilingual and multilingual communities and other situations in which languages and cultures come into contact (Bayley & Schecter, 2003; Garrett & Baquedano-López, 2002). Kulick's (1992) study of language shift and language socialization in Gapun, Papua, New Guinea is a landmark in this respect. Adults in this small-scale society traditionally spoke the vernacular language as well as one or more other languages. However, under the influence of modernization, Gapuners began to valorize the local Creole language. Kulick found that adults unwittingly interacted with children in ways that systematically denied them access to the vernacular language, resulting in its rapid decline. This study not only linked two trajectories of change (historical change and childhood socialization) but also showed that language ideologies linking gender, affect, and language played a critical role in imperiling the vernacular language.

As scholars turn their attention to language socialization in heterogeneous situations, such as changing language policy in nation states, transnational migration, postcolonial settings, and linguistically diverse institutions (e.g., Fader, 2001; González, 2001; He, 2001; Sandel, 2003), they have begun to problematize important ideas. Garrett and Baquedano-López (2002) point out that such studies reveal that the boundaries of language communities are fuzzy, permeable, and shifting; community can no longer be defined as "geography, language(s) spoken, or broad presupposed social categories such as race or ethnicity, but in terms of mutual social and interactive engagement" (p. 347). Such studies underscore the need to know more about how children navigate and interweave multiple languages, meaning systems, and genres, a process that is also gaining attention in studies of narrative.

Narrative: Getting Those Stories Straight

Narrative is a cultural universal, and one of the most powerful interpretive tools that human beings possess for organizing experience in time and for interpreting and valuing human action. The literature on narrative is vast, and the list of topics relevant to cultural psychology is long. These include the relationship between nar-

rative and memory (e.g., Neisser & Fivush, 1994), the role of narrative in the construction of selves and identities (e.g., Bruner, 1990a, 1990b; Gergen, 1991; Holland, Lachicotte, Skinner, & Cain, 1998; Wortham, 2001), narrative as a therapeutic technique in psychotherapy and psychoanalysis (e.g., Polkinghorne, 1988; Spence, 1982), and narrative in family life (Pratt & Fiese, 2004). Children's narratives have been of keen interest to scholars for the light that they shed on linguistic development (Berman & Slobin, 1994), peer culture (Corsaro, 1997; Goodwin, 1990), literacy (e.g., Michaels, 1991; Wolf & Heath, 1992), and classroom life (Dyson & Genishi, 1994; Nicolopoulou, 1997). Faced with this embarrassment of riches, we have chosen, to focus on a single issue: the role of oral narrative in early socialization. This focus maintains continuity with the previous discussion of socialization through discursive practices while allowing exploration of cultural diversity in greater depth.

Varieties of Oral Narrative

Keith Basso (1996) begins his classic paper on Western Apache oral narratives with an interpretive puzzle. What did Western Apache elders mean when they made the following statements:

> Our children are losing the land. It doesn't go to work on them anymore. They don't know the stories about what happened at these places. That's why some get into trouble. (p. 38)
>
> . . . . I recall stories of how it once was at that mountain. The stories told to me were like arrows. Elsewhere, hearing that mountain's name, I see it. Its name is like a picture. Stories go to work on you like arrows. Stories make you live right. Stories make you replace yourself. (p. 38)

Basso's (1996) attempts to understand the significance of these statements yielded one of the most comprehensive accounts available of a group's shared understanding of how oral narrative functions in their lives. Working in collaboration with informants whom he had known for many years, Basso discovered that Western Apache storytelling exploited two symbolic resources—land and narrative—for maintaining the moral order.

Western Apache use stories about the early history of the group to establish enduring ties between individuals and features of the natural landscape. Because of these bonds, people who have behaved improperly are moved to reflect on and correct their misconduct. At times, a member of the community might find it necessary to "aim" a story at an offender. If taken to heart, the story and the place with which it is associated will "stalk" the offender and promote beneficial change.

Basso's study illustrates three issues of plurality that apply to the study of oral narrative as a socializing medium. First, the most obvious is the issue of narrative diversity across sociocultural groups. Basso describes a distinctive cultural case that is sufficiently detailed to allow precise comparison and contrast with other cultural cases. Second, although the study focuses primarily on one type of oral narrative—historical tales—it situates them in the full range of native narrative categories, including myths, sagas, and gossip. The plurality of oral narrative types in the culture is thus established. Third, access to and ownership of narrative genres is socially distributed, introducing another source of intracultural variation.

Storytelling Begins Early

A question left unanswered by Basso's account is how Western Apache narrative practices intersect with children. For example, when do Western Apache begin to aim historical tales at errant children? An exciting trend in recent developmental research is the strong interest in young children's narratives. There is a growing body of evidence that children from many cultural backgrounds within and beyond the United States begin to tell stories in conversation during the second or 3rd year of life (e.g., Eisenberg, 1985; Engel, 1995; McCabe & Peterson, 1991; Meng, 1992; Ochs & Capps, 2001). At this early age, children step into the narrative practices of family and community, thereby laying claim to an important cultural resource for creating their own socialization (Bruner, 1990a, 1990b). Even linguistically isolated deaf children, whose parents choose not to expose them to a conventional sign system, were able to create gestured narratives (Van Deusen-Phillips, Goldin-Meadow, & Miller, 2001). These stories carried echoes of culture-specific meaning, suggesting that conversational narrative is a remarkably robust medium of socialization.

Personal storytelling not only emerges early in life but it also occurs habitually in a wide variety of communities, occurring especially frequently in working-class communities. For example, stories involving 2½-year-olds occurred at average rates of 3 to 4 per hour in both middle-class Taiwanese and middle-class European American families (P. J. Miller, Wiley, Fung, & Liang, 1997; Wiley, Rose, Burger, & Miller, 1998). Narratives accounted for one-quarter of 2-year-olds naturally

occurring talk in working-class African American families in the Black Belt of Alabama (Sperry & Sperry, 1995, 1996). In working-class European American families in Chicago, 3-year-olds participated in co-narrations at the remarkable rate of 6 times per hour (Burger & Miller, 1999). When personal storytelling occurs so abundantly, it gets woven, densely but almost invisibly, into the fabric of young children's social experience.

Moreover, regardless of where they occur, these small, mundane stories are saturated with value and replete with culturally patterned messages. Stories vary within and across cultures along a host of parameters that encompass how the genre is defined and practiced (P. J. Miller & Moore, 1989). For example, in her classic ethnography of neighboring working-class communities in the Piedmont Carolinas, Heath (1983) found that the European American residents of Roadville adhered to a criterion of literal truth when narrating their personal experiences. This contrasted with the African American community of Trackton, who strongly favored fictional embellishment. Trackton and Roadville also enacted opposing norms toward and away from self-aggrandizement. Trackton children not only created bold and triumphant self-protagonists but also asserted their rights to tell stories by adroitly working their way into adult talk, commanding the floor, and receiving approbation for their verbal artistry.

In their study of an African American community in rural Alabama, Sperry and Sperry (1995, 1996) found that 2-year-olds produced more fantasy stories than factual stories of past experience. "Both caregivers and children enjoyed telling stories of escaping from 'Nicoudini,' the 'Boogabear,' 'Werewolf', or the spectral deer who entered their home one misty evening. Families told such stories easily and frequently, and children gathered around to be thrilled by the imagined terror and to practice creating it themselves" (p. 462; Sperry & Sperry, 1996). Boys' efforts to tell fantasy stories received much more support than girls', a finding that may help to explain how men in this community get to be so good at "tall-bragging."

P. J. Miller, Fung, and their colleagues compared middle-class Taiwanese families in Taipei and middle-class European American families in Chicago and found that in both cases narrators interpreted young children's past experiences in interpersonal terms, situating the child in relationship to other people (P. J. Miller et al., 1997; P. J. Miller, Fung, & Mintz, 1996). At the same time, personal storytelling differed dramatically: Taiwanese families were much more likely than their European American counterparts to tell stories in which they cast the child protagonist as a transgressor. In keeping with local beliefs that parents should take every opportunity to correct young children, many of these stories occurred immediately after the focal child had committed a misdeed in the here and now. Families repeatedly invoked moral and social rules, structured their stories to establish the child's misdeed as the point of the story, and concluded their stories with didactic codas. By contrast, the European American families enacted a self-favorability bias, erasing or downplaying children's misdeeds. These differences were also evident in parents' beliefs about storytelling (P. J. Miller, Sandel, Liang, & Fung, 2001) and in pretend play (Haight et al., 1999).

Wang, Leightman, and colleagues compared stories elicited from Chinese and European American children and reported similar findings. Chinese mothers from Beijing showed a greater concern with moral rules and behavioral standards when co-narrating stories with their 3-year-olds (Han, Leichtman, & Wang, 1998; Wang, Leichtman, & Davies, 2000), and 6-year-olds told stories exhibited a parallel concern with moral correctness (Wang & Leichtman, 2000).

Thus, although personal storytelling is a rich purveyor of values for European American children, the version of personal storytelling practiced by the Taipei and Beijing children leans more strongly in a didactic direction, reflecting and reinforcing larger systems of meaning that privilege moral education. Fung, Miller, and Lin (2004) link this didactic bias to Confucian discourses that valorize teaching, listening, and self-improvement, discourses that continue to circulate in the complex mix of local and global influences that are reshaping childrearing and education in contemporary Taiwan. Li (2002) found that Chinese college students viewed learning as a moral process, imbued with purpose, undertaken according to the virtues of diligence, persistence, and humility, and encompassed by the larger project of self-perfection, but American college students saw learning as a neutral, mental process of knowledge acquisition. The stories told by the Beijing children and their mothers share a similar moral cast.

In sum, studies of children's early storytelling in families and communities demonstrate that this narrative genre is culturally differentiated from the beginning. Wherever personal storytelling is practiced with young children, it takes on local color, absorbing values, affective stances, and moral orientations. As children

participate routinely in personal storytelling, they begin to carve out different versions of personal experience. Personal storytelling thus highlights—and is implicated in—an early developmental moment in the co-creation of person and culture. Particular frameworks of evaluation and interpretation, linked to larger currents of cultural meaning, operate again and again in oral stories, while narrators and listeners create and respond to here-and-now social contingencies. Each co-narrated story, each story aimed at or told around the child provides another opportunity for the child to hear which experiences are reportable and how these experiences should be assessed. In this way, interpretive frameworks are not only reproduced but also repeatedly instantiated in personally relevant terms. To return to the comparisons between European Americans, on the one hand, and Taiwanese or Chinese, on the other, we catch a glimpse of how culturally distinct selves might originate. A need for positive self-regard may be rooted, in part, in storytelling that is systematically biased toward self-favorability, whereas an inclination to self-improvement may be rooted, in part, in the narration of misdeeds and the explicit invocation of moral standards (see the following section: "The Development of Self").

Although comparative studies, informed by local practices and understandings, are necessary for identifying these kinds of divergent developmental pathways, again we emphasize that it is important not to dichotomize such differences, erasing similarities across groups and variations within groups. Evidence is accumulating, for example, that personal storytelling is especially rich in gendered meanings (Nicolopoulou, 1997; Ochs & Taylor, 1995). Again, this differentiation is apparent early in development. Fivush and her colleagues found that middle-class European American children's oral narratives are gendered in numerous ways during the preschool years and beyond. For example, when asked to elicit stories from their young children about specific emotions experienced in the past, mothers co-constructed more elaborate stories about sadness with their daughters than with their sons (Fivush, 1993). Similar findings emerged when fathers served as co-narrators. Even when parents were asked to talk with their children about novel past events (without being asked to elicit talk of specific emotions), mothers and fathers narrated more emotion events with their 3-year-old daughters, compared with their sons, and this contrast was especially marked for sad events (Kuebli & Fivush, 1992). From these and other studies, Fivush and Buckner (2000) conclude that by the end of the preschool years, girls talk much more about sadness than do boys, and that such talk occurs both with parents and friends, possibly contributing to girls' vulnerability to depression.

Variability and Heterogeneity

In addition to these ways in which early narrative varies in and across cultures, a practice approach to narrative reveals even more sources and dimensions of variability. Ochs and Capps (2001) developed a dimensional approach to conversational stories of personal experience, arguing that personal narrative oscillates between the narrators' desire for coherence and their desire for authenticity, but that research has tended to privilege the former. The "default" story involves one active teller, crafting a linearly sequenced, coherent account of a highly tellable event. Such stories are framed by a constant moral stance and are easily detached from surrounding discourse. Researchers should not assume that this default version of storytelling is the only adult model or endpoint of development. Ochs and Capps propose that development proceeds along two lines. Children become able to report norm violations and to produce temporally ordered, coherent narratives; at the same time they learn to use stories in a nonlinear manner to puzzle over events and weigh alternatives.

Ochs and Capps (2001) draw attention to a variety of overlooked or understudied aspects of storytelling that could enrich cultural psychologists' understanding of narrative as a socializing medium. How do children use narratives for problem solving; expressing, negotiating, or failing to negotiate divergent points of view; grappling with moral dilemmas; pondering hypothetical scenarios; envisioning the future? How are children's stories embedded in surrounding discourse and activity? What participant roles are available to children?

Much of the developmental research on preschoolers' stories has focused on children as co-narrators, producing stories about their experiences in collaboration with parents or other family members. Less is known about children as listeners, recipients, overhearers, and eavesdroppers. By way of illustrating the importance of these other participant roles, consider two examples. In the working-class community of South Baltimore, adults and older children told a great many stories of personal experience to one another (P. J. Miller, 1994). Young children were present as bystanders to these stories, free to tune in or not. Many of these stories fell toward the

default end of the continuum highlighted by Ochs and Capps (2001) and were highly performed, riveting accounts, ranging from the hilarious (e.g., the bathtub fell through the floor with Aunt Sharon in it) to the harrowing (e.g., violent encounters in school or on the street). This activity not only modeled narrative virtuosity but also provided curious youngsters with a constantly updated source of information about the lives of significant others, including their mothers' experiences of school, workplace, and male-female relations.

Whereas this study illustrates what a rich and varied socializing medium stories around the child can be, C. E. Taylor (1995) offers a rare, penetrating analysis of how keenly children listen to stories told around them. In one case study of a middle-class family, the 5-year-old sister and 8-year-old brother were initially silent when their parents engaged in narrative conflict at the dinner table. Eventually, the sister protested that the parents were fighting, a concern that they dismissed and rationalized as the conversation continued to unfold. This study not only shows how carefully children monitor adult discourse but also serves as a powerful reminder of two other important points: family narrative is sometimes unfriendly and threatening, exacerbating rather than solving problems, and children are socialized as much by the relationships that participants enact—in this case, parental conflict—as they are by the content of stories.

In her analysis, C. E. Taylor (1995), like several of the scholars mentioned in this section of the chapter, borrowed ideas from Mikhail Bakhtin, the Russian literary scholar and philosopher of language. His vision of language as culturally shaped and socially situated is compatible with the conception of language described earlier (Bakhtin, 1981; Wertsch, 1991). Bakhtin (1986) stressed that speech is organized into genres associated with particular speech situations. He argued that speech is never free of generic constraints but that speakers can achieve individuality of expression by creatively appropriating, combining, and reaccenting existing genres. As researchers apply Bakhtinian constructs to the analysis of children's discourse, it is becoming clear that narrative sense-making involves juxtaposing and interweaving multiple, even conflicting voices and ideological perspectives and that every community affords such heterogeneity (e.g., Cazden, 1993; Dyson, 1993; Hicks, 1994; Tobin, 2000; Wertsch, 1991; Wortham, 2001).

This perspective not only underscores the importance of studying children's narrative repertories (e.g., Preece, 1987; Sperry & Sperry, 1995) but also draws attention to the many ways in which stories are embedded in, are blended with, or otherwise keep company with other stories, other genres, and other activities. For example, ethnographic studies have shown that oppositional talk is an important means by which working-class African American children of various ages construct identities, form friendships, and sustain peer culture and that narratives are often incorporated into oppositional talk as a way of instigating disputes and projecting conflicting points of view (e.g., Goodwin, 1990; Shuman, 1986). The preschooler studied by Corsaro et al. (2002) was already adept at this kind of talk and collaborated with her Head Start peers in producing pretend scenarios that drew on both oppositional and narrative elements. Fung and Chen's (2001) study of the socialization of shame in Taiwanese families revealed that naturally occurring events of shame included multiple episodes and traversed multiple temporal and spatial worlds. Young children were led to relive and reflect on present and past transgressions and to prepare for a better self in the future. Both of these studies suggest that stories do not necessarily come neatly packaged and clearly bounded in children's everyday experience. Rather, stories are embedded in and overlap with other genres in heterogeneous and shifting configurations that illuminate again and again particular threads of meaning for young participants.

The Dynamics of Narrative Practices

Thus, when narratives are treated as situated practices, rather than disembodied texts, it becomes apparent that storytelling is a dynamic process, emerging from particular circumstances, shaped by the interests of narrating participants, recurring in different combinations, and affording children a range of participant roles. Children engage repeatedly in networks of narrative practices, characterized by systematic variability and cross-cutting redundancies. As argued earlier, this is one of the means by which persons and cultures are cocreated. However, narrative is also a means by which individuals affect change and transform identities (Holland et al., 1998; Wortham, 2001).

The dynamic nature of narrative practices is especially apparent when narrators tell the same story repeatedly. Such stories can play a critical role in the lifelong process of socialization. Adults may be haunted, baffled, or sustained for decades by stories from their own or others' lives (e.g., Coles, 1989; Fung,

2003; Gone, 1999; Hudley, Haight, & Miller, 2003; Steedman, 1986). As the person tells the story repeatedly to self and other, it accrues layer on layer of meaning and may be used to reinforce favored interpretations or to construct new interpretations. Repeated tellings and reinterpretations of personal experience are institutionalized in psychotherapy, Alcoholics Anonymous, and religious conversion (Holland et al., 1998; Stromberg, 1993). Children as young as 2 years of age develop intense attachments to particular stories, revisiting them again and again for weeks, months, and even years (e.g., Alexander, Miller, & Hengst, 2001; P. J. Miller, Hoogstra, Mintz, Fung, & Williams, 1993; Nelson, 1989; Wolf & Heath, 1992). The middle-class European American children in these studies treated their special stories as resources for discussion and pretense and used them to ponder problems and manage emotions, activities that were supported by parents. These studies suggest that from the time young children enter into narrative sense-making, they have the capacity to respond differentially to the ordinary narrative flow, seizing certain stories for especially active and intense engagement.

Studies that trace the natural history of stories in children's lives are rare. This is unfortunate for cultural psychology because the process of retelling and revising stories goes to the heart of the socialization process. It is assumed to be transformative in theories ranging from psychoanalysis to the Western Apache model of historical narrative. We need especially to know more about how stories operate over the long term in children's lives.

Again, the Western Apache provide a compelling example. Basso (1996) relates an incident in which an adolescent girl arrived at a ceremonial in hair curlers, a violation of community standards. Some weeks later, when the girl was attending a party at her grandmother's house, the grandmother narrated a historical story about an Apache policeman who suffered dire consequences because he had acted too much like a white man. At the conclusion to the story, the girl left the party. When questioned by Basso, the grandmother explained her granddaughter's sudden departure by saying that she had shot her with an "arrow." Two years later, the young woman told Basso that she threw her curlers away after reflecting on her grandmother's story. Referring to the place where the Apache policeman had lived, she said, "I know that place. It stalks me everyday" (Basso, 1996, p. 57).

THE DEVELOPMENT OF SELF

As noted earlier, the psychological side of cultural psychology is the study of the things that the "I's" (the subjects, agents, or selves) of particular cultural communities know, think, feel, want, and value, including what they know, think, feel, want, and value about the self as a mental being capable of subjective experiences and of participation as an agent in a cultural community. A powerful way in which culture and psyche constitute each other and come to influence individual behavior, we believe, is through our way of being a subject or agent in a social world—what is often called *self-functioning*.

Indeed, the self can be conceptualized as a primary locus of culture-psyche interaction and culture-specific being (see Baltes, Lindenberger, & Staudinger, Chapter 11, this *Handbook,* this volume). It is where the individual, a biological entity, becomes a meaningful entity—a person, a participant in social worlds (P. J. Miller, 1994; Rogoff, Radziszewska, & Masiello, 1995; Weigert, Teitge, & Teitge, 1990). Developing a sense of self as an agentic, continuous entity with intentional powers may appear to arise from highly personal idiosyncratic experiences: A European American self is indeed defined to be individualized and distinct from other selves. Studies highlight, however, that although the experience, structures, and processes of self appear to be primarily individual creations, they are also cultural and historical constructions (Markus & Kitayama, 2003; J. G. Miller, 2003; Oyserman & Markus, 1993).

Before discussing the cultural psychology of the self, we must acknowledge some of the issues and controversies arising in this area. Several trends in philosophy, the social sciences, and world affairs have converged on self and identity as popular topics for research. Perhaps most obviously, as the headlines of any newspaper confirm, nationalism and a concern for maintaining and asserting ethnic or cultural identity are now emerging as a powerful focus in Eastern Europe, the Middle East, Africa, and Asia. In this climate of heightened ethnic identification and conflict, we can no longer afford to ignore the role of cultural practices and mentalities as sources of personal and social identity or the role of self-management and self-regard in all aspects of social life, particularly social conflict (e.g., Crocker, Major, & Steele, 1998; Kakar, 1996).

Perhaps less obviously, certain eternal disputes about the character and causal role of personal identity

in psychological functioning have resurfaced. Several quite disparate currents of thought, including skeptical postmodernism, connectionist-parallel distributed process models in artificial intelligence, and Buddhist philosophical thought (Elster, 1987; Gergen, 1991; Sass, 1992; Varela, Thompson, & Rosch, 1993) have concluded that the self is illusory or epiphenomenal and plays no causal role in mental functioning, whereas other have argued that the self is "multiple" or "protean" (Lifton, 1993).

We will not debate here whether the Buddhists are right that the self is an illusion or whether the Hindus are right that the self is the real component of pure being. We will simply note that the very existence of human social and moral life seems intimately tied up with the evolution of a species whose central psychological makeup is defined by the existence of a causally active and somewhat unitary self ("One self per customer," to use the philosopher Daniel Dennett's phrase; Flanagan, 1992): A self that is free, willful, self-regulating, morally responsible, and conscious; that is the initiator of action, author of texts, holder of rights; and that is the subject of evaluation and social scrutiny when questions about rationality, responsibility, normality, and pathology arise.

Putting aside "epiphenomenalism" (the self as unreal), the choice between "mechanistic" and "vitalistic" conceptions of self seems uninviting (see Kapstein, 1989). Contemporary mechanistic approaches to personal identity argue that our sense of self (e.g., our sense of continuity over time) results merely from the continuity of our memory for discrete mental states (perceptions, pleasure, and pain). Contemporary vitalistic approaches argue that our sense of self is prewired into the human brain. Neither view leaves much room for social, interpersonal, or cultural processes in the construction and maintenance of personal identity.

Perhaps versions of these approaches can be made compatible with cultural psychology, which asserts that the self is not fully reducible to either memory or brain processes. A cultural psychology approach to personal identity examines the part of our sense of self that develops through membership in some local cultural community and symbolically mediated experiences with its practices. This approach examines the effects of labeling and stereotyping, dialogue and narrative, as well as moral agency and social practice on self-functions such as self-regard, self-confidence, and self-definition. It looks at how the self is described, responded to, evaluated, and often regulated by others. Although cultural psychologists acknowledge that the "I" (the subject) is never fully determined by groups' hegemonic ideologies or interpersonal forces alone, they aim to clarify the ways cultural mentalities and practices (including ideologies of the self and symbolic products such as biographies of community exemplars) can powerfully constitute an individual's sense of self.

A cultural psychology perspective furthers our understanding of a self's development by emphasizing that particular ways of representing and being a self, both as object and subject of experience, are grounded in normative understandings and behavioral routines of selfhood in a given sociocultural and historical context (Benson, 2001; Murphy-Berman & Berman, 2003; Oyserman & Kemmelmeier, 1995; Oyserman & Markus, 1993).

From the perspective of cultural psychology, the self is grounded in the mentalities and practices (the custom complex) associated with being an "I" (a subject) in a particular community. Revisiting the insights of some of the field's early theorists (e.g., Dewey, 1938; Erikson, 1968) reveals that culture does not merely surround or cover the "universal" child but rather that culture completes the child (Bruner, 1990a, 1990b; Tomasello, 1999). Culture provides the scripts for "how to be" and how to participate as a member in good standing in the cultural community and particular social contexts. Simultaneously, cultural psychologists recognize that children and adults actively constitute their own cultures, initiating changes in their relations with others and thus in their immediate cultural settings (see Brandtstädter, Chapter 10; Rathunde & Csikszentmihalyi, Chapter 9, this *Handbook,* this volume).

DEFINING AND LOCATING THE SELF AS DYNAMIC, MULTILEVEL, AND MULTIFACETED

The self can be defined as a multifaceted, dynamic system that regulates and mediates behavior (Banaji & Prentice, 1994; Markus & Wurf, 1986). Neisser (1988, 1991) explicitly constructs the self as a multileveled entity, defining five types of self-knowledge: (1) ecological, (2) private, (3) interpersonal, (4) conceptual, and (5) what he labels "extended" (i.e., knowledge of the self over time). Neisser contends that regardless of differing locations or beliefs, people are active, embodied

agents in the natural and social environments, and thus show evidence of ecological and interpersonal selves (Neisser & Jopling, 1997).

This multileveled self is believed to be broadly consequential for individual experience: It provides the blueprint, frame, and foundation for the psyche. Whatever cultural form it assumes, a subject's way of being a person affords and constrains what he or she feels, values, assumes responsibility for, perceives and thinks about, as well as how he or she organizes, understands, and gives meaning to any experience.

The past decade has seen rapidly increasing interest in the nature, functioning, and development of self, and much noteworthy theoretical activity. Several themes can be identified that raise challenging questions about what a self is, how to determine who has one, as well as how and when the self emerges, functions, and develops. Many researchers advocate analyzing the self as not only an object of knowledge but also the subject of experience. Attention to the embodied self, to the role of intersubjectivity in constructing the self, to the situation, context, or niche in which the self participates and to the self as socially engaged rather than isolated or decontextualized is needed (Cole, 1999; Crook, 2003; Harter, 1996; Higgins & Parsons, 1983; Stern, 1985; Tomasello, Kruger, & Ratner, 1993). Cultural psychology research forcefully underscores such issues' importance and raises many complementary concerns (e.g., Greenfield & Cocking, 1994; Valsiner, 1988).

The Conceptual Self

The self has been variously defined as the insider's grasp on the person, as the answer to the "who am I" question, and as a theory or set of schemas that provides the individual with a sense of continuity. The focus has been on the self as object of knowledge (Allport, 1937; Eder & Mangelsdorf, 1997; Epstein, 1973; Kihlstrom & Cantor, 1984; Sullivan, 1940). Historically, despite many theoretical statements to the contrary, the tendency has been to reify the self and regard it as a thing, as exemplified in thousands of studies on *the* self-concept, *the* self, or self-esteem.

Research on the development of self has tended to concentrate on what Neisser labels "the conceptual self." Given the general European American tendency to imagine the mind as the source of experience and thus equate selves with minds, the emphasis on how children think about and represent the self is perhaps obvious. From this theoretical perspective, the self becomes an object of knowledge and it becomes natural to imagine that the self as represented or the *self-concept* is the most significant aspect of individual experience.

In research on development of the self-concept, the critical indicator of the self has been visual self-recognition as assessed by mirrors and photographs. Summarizing the work in this paradigm, Bullock and Lütkenhaus (1990) conclude that self-recognition begins between the ages of 9 and 16 months and by 2 years of age, most children recognize themselves in the mirror and photographs. Some (e.g., M. Lewis, Sullivan, Stanger, & Weiss, 1989) have argued that self-awareness requires such self-recognition. Other studies have examined speech for cognitive representations of self. During their 2nd and 3rd years, children begin to use their name, the pronouns "I" and "me," and possessively claim objects as theirs (L. E. LeVine, 1983; Van der Meulen, 1986).

The idea that thinking about the self is the main element of self is also underscored by a large collection of studies that have explicitly tied the development of self to advancing cognitive capacities (Leadbeter & Dionne, 1981; Leahy & Shirk, 1985; Montemayor & Eisen, 1977; Rosenberg, 1986). Many studies based on the Piagetian model of cognitive development have shown that as a child advances from preoperational thought to formal operations, the focus of self-definition shifts from concrete, objective, and visible characteristics to abstract, private features of the psychological interior. A widely cited review by Harter (1983) notes:

> Young children focus on concrete, observable aspects of self such as physical attributes and behaviors, whereas older children increasingly couch their self-descriptions in terms of traits. With adolescence, there is a further shift toward the use of abstractions and psychological processes such as thoughts, attitudes, and emotions in defining the self. (p. 305)

Still other studies have shown a link between the level of cognitive development and characteristics of the self-concept such as hierarchical organization, integration of opposing conceptions of the self, and the stability of self-conceptions across time and context (see Harter, 1990; Rosenberg, 1986, for reviews).

Indeed, studies with people living in European American contexts demonstrate that such self-concepts exist. These self-concepts include images and conceptions of the person in the present but also in the past and

in the future—narratives of what could have been and what might be (Higgins, 1990; Markus & Nurius, 1986; Oosterwegel & Oppenheimer, 1993). This self-concept is also functional: It mediates behavior and is implicated in all aspects of behavior from strong academic and athletic performance to general well-being and life satisfaction. A negative self-concept of this type is related to delinquency, drug use, and depression (for a review see Bracken, 1996).

The Cultural Self

A cultural psychology approach emphasizes the need to analyze more extensively the experience and understanding of self and to examine critically the cultural presuppositions implicit in much research on the development of self. As stated earlier, the cultural psychology approach to development is skeptical of most attempts to universally define progressive development using abstract criteria, for instance, from behavior to traits or from context-dependent to context-free.

In studies of selves in non-European American cultural contexts, one quickly confronts selves that are not easily characterized by complex mental representation of traits, attributes, preferences, or possessions. It becomes evident that studies on the development of self have proceeded primarily from one cultural viewpoint and drawn on a set of invisible and untested assumptions about the self as an idea or as an objectified and cognitively represented entity.

Comparative research in other cultural communities suggests that selves are not primarily more-or-less stable concepts at all but rather a set of processes or ways of being. Moreover, in some groups, a description of self or others in terms of internal, decontextualized attributes or qualities simply does not occur (Fajans, 1985; Hart, Fegley, Hung Chan, Mulvey, & Fischer, 1993; Lillard, 1996; J. G. Miller, 1984; Ochs, 1988; Rosen, 1995; Shweder & Bourne, 1984). Hart and Edelstein (1992) describe a study conducted with adolescents in Iceland in which one student struggled mightily to answer the "who am I" question and finally in despair looked up from his blank questionnaire and asked, "Are people meant to have these kinds of thoughts about themselves?" In many cultural communities, the nature of self is referenced not to an internal self but instead to a particular social context and characterizing a self outside that context is unnatural and irrelevant.

Goodnow (1990a, 1990b) has argued that cognitive development involves learning the community's definition of being intelligent. Similarly, developing a self requires incorporating the community's definitions of being a self. Once self-development is considered in cultural context, it is almost immediately apparent that what a self is and what it means to be an acceptable or good self can vary dramatically from one cultural place to another (Markus & Kitayama, 1991b; Shweder & Bourne, 1984). As C. Taylor (1989) has argued:

> My self-definition is understood as an answer to the question Who am I. And this question finds its original sense in the interchange of speakers. I define who I am by defining where I speak from, in the family tree, in social space, in the geography of social status and functions. We first learn our languages of moral and spiritual discernment by being brought into an ongoing conversation by those who bring us up. The meanings that the key words first had for me are the meanings they have for us, for me and my conversation partners together. So I can only learn what anger, love, anxiety, the aspiration to wholeness, and so on are through my and others' experience for us in some common place. (p. 35)

THE ONTOLOGICAL BASIS OF SELF

The study of self in psychology, as with many aspects of child development, has incorporated the European American definition of being a person and has been firmly rooted in the ontology of individualism (Greenfield & Cocking, 1994; Ho, 1993; Markus & Kitayama, 1994a; Sampson, 1988). This ontology is extensively incorporated in most child-care practices and the main societal institutions such as schools.

The Person as an Individual

The Latin word "individual" means indivisible and whole, and the central tenet of individualism is the epistemological priority accorded to the separate, essentially nonsocial, individual. The person is assumed to exist independently and to enter into social relations based on need and by mutual consent with other individuals. The focus is on the individual rather than on the social unit of which the individual is a part. The person is cast as an entity whose behavior is determined by some amalgam of internal attributes apart from the external situation.

Individualism is typically analyzed as the critical element of Western society (e.g., Baumeister, 1987; Car-

rithers, Collins, & Lukes, 1987; Guisinger & Blatt, 1994; Sampson, 1985; Triandis, Bontempo, & Villareal, 1988), and many analysts argue that the Enlightenment gave birth to the notion of the Kantian individual and the importance of individual reason and free will. Others suggest that individualism shows the stamp of late industrial capitalism or results from a Cartesian categorization system that draws a sharp distinction between the self and others (Lebra, 1992).

In the framework of individualism, it seems natural to assume that selves are objects and should be unified and integrated, reflecting but not focusing on the concerns of others. Thus, a child's central task is to progressively realize that he or she is separate from others and autonomous, efficacious, in control of his or her actions. The idea of a bounded individual separate from and not unduly influenced by others also leads to a consistency ethic in which a good or authentic self is the same, unchanging self across different situations. (See Fiske, Kitayama, Markus, & Nisbett, 1998; Gergen, 1968; Johnson, 1985; Markus & Kitayama, 1994b; Morris, 1994; Shweder & Bourne, 1984, for a more elaborate discussion.)

The literature on the development of self is also replete with unexamined presuppositions that reflect individualism interwoven with other cultural and historical assumptions. In this literature, interest persists in being a true rather than a false self, which probably echoes Victorian concerns with secret or hidden parts of the self (Baumeister, 1987; Harter, 1986). Currently, there is also pervasive attention to raising children who feel good about themselves and have high self-esteem, aims that derive from societal appropriation of expressing rather than inhibiting feelings, actualizing the self, and fulfilling our potential (Maslow, 1954). The literature on self development also incorporates presuppositions about what type of parenting practices produce these proper or good selves. Thus, the child with high self-esteem is believed to be a product of accepting and approving parenting that highlights a child's successes rather than failures (e.g., Coopersmith, 1967; Heine, Lehman, Markus, & Kitayama, 1999).

The Person as Relational

The individualist model of self that provides the infrastructure for the field's understanding of self is an obvious, natural model for European American researchers. This model is rooted in a set of Western philosophical positions about human nature and in layers upon layers of practice and institutions that give it an objective reality. This model is indeed powerful and practical for characterizing selves in European American contexts, but it is not the only model of how to be. Other ontologies and ideologies of human nature exist that are as yet unrepresented in the literature on the development of self. Analyzing the self in cultural context brings these other ontologies and ideologies of self to light.

Another model of self contrasts significantly with individualism and is pervasive throughout Japan, China, Korea, Southeast Asia as well as much of South America and Africa (Triandis, 1989). According to this perspective, the self is not and cannot be separate from others or the surrounding social context, but is experienced as *interdependent* with the social context: the self-in-relation-to-other(s) is focal in individual experience (Markus, Mullally, & Kitayama, 1997; Triandis, 1989, 1990). According to Kondo (1990), the self is fundamentally interdependent with others from a Japanese perspective, and understanding this Japanese sense of self requires dissolving the self-other or self-society boundary that forms such an obvious starting point in European American formulations.

An important imperative in this alternative way of being is to avoid becoming separate and autonomous from others and, instead, to fit in with others, to fulfill and create obligations and, in general, to become part of various interpersonal relationships. Individuals are naturally understood to exist interdependently with others. Sharing, interweaving, or intersubjectivity is the established cultural rule, not a mystical or magical project (Ames, Dissanayake, & Kasulis, 1994). From this perspective, the individual is an open, communicating center of relationships and thus is intimately connected with other selves. From a Confucian perspective, groups are not separate from individuals. The nature of individuals is to work through others, and to reveal themselves, they must be parts of groups such as families, communities, and nations (Tu, 1994). Moreover, sources of action are found in a person's pattern of involvements with others, rather than internal mental states or processes.

An interdependent view of self does not, as might be imagined from a European American perspective, result in a merging of self and other, nor does it imply that people lack a sense of themselves as agents originating their own actions. This interdependent view requires a high degree of self-control, self-discipline, and agency to effectively adjust oneself to various interpersonal contingencies. Control, however, is directed primarily to

personal desires, goals, and emotions that can disturb the harmonious equilibrium of interpersonal transaction.

This understanding of self stands in contrast to a European American notion of control that entails asserting our desires, goals, and emotions, and attempting to change features of the social situation. Hamaguchi (1985) for example, reports that for Japanese the "straightforward claim of the naked ego" (p. 303) is experienced as childish. Self-assertion is viewed as a sign not of authenticity, but instead of immaturity. This point is echoed in M. I. White and LeVine's (1986) description of the meaning of *sunao,* a term Japanese parents use to characterize what they value in children:

> A child that is sunao has not yielded his or her personal autonomy for the sake of cooperation: Cooperation does not suggest giving up the self, as it may in the West: It implies that working with others is the appropriate way of expressing and enhancing the self. Engagement and harmony with others is, then, a positively valued goal and the bridge—to open-hearted cooperation. (p. 58)

Being responsive to or influenced by others does not indicate inconsistency or false selves at work; rather, it reflects tolerance, self-control, flexibility, and maturity. In many Asian perspectives, children are assumed to be both naturally good and capable of developing the needed sensitivity to and empathy for others through encouragement and example. The good child is believed to be a product of highly responsive parenting practices attuned to the child.

Nevertheless, good parenting does not ignore a child's failures, shortcomings, or transgressions. In Japan, children are encouraged to engage in self-reflection and self-criticism as necessary steps to self-improvement and mastery (e.g., C. C. Lewis, 1995). Similarly, Chinese parents often use an explicitly evaluative, self-critical framework with their children as opposed to an overtly self-affirming one (P. J. Miller et al., 1996). Chinese caretakers claim that shaming as a caretaking practice keeps children from falling into disgrace or losing their all-important connection to others.

Much more could and must be said about these apparently startling differences in ontological assumptions, to which we are alerted when we conduct research in other cultural communities. A comprehensive investigation would not merely contrast "individualism" and "interdependency," but also draw on other ontologies that must exist on a worldwide scale. Nor should we imply a lack of variability in Japanese, Chinese, or Korean populations. We simply underscore that comparative research reveals divergent views of what the self is and should be on a worldwide scale, and that these views critically underpin self-relevant experiences.

If the self functions as an interpretive, integrative, or orienting framework for individual behavior, then whether one has a self shaped by prevalent European American or Asian ontological traditions can matter greatly for individual psychological processing. Comparing behavior constructed in a European American individualistic frame to behavior constructed in other cultural frames may illuminate how cultural processes are implicated in the etiology, nature, and functioning of psychological systems, and how "multiple, diverse psychologies" arise.

CULTURAL DIVERSITY IN WAYS OF BEING

Much of the rapidly expanding literature relevant to cultural variation in the development of self does not focus directly on the nature and functioning of the psychological self system as it has been operationalized in American and European studies. Nevertheless, such comparative literature is pertinent to research on the origins of culture-specific selves.

In examining the culture-specific nature of selves, Markus et al. (1997) have described the custom complexes associated with being a person. They suggest that cultural and social groups in every historical period are associated with characteristic patterns of sociocultural participation or, more specifically, with characteristic ways of being a person in the world, which they call *selfways.* Selfways are patterns or orientations, including ways of thinking, feeling, wanting, and doing, that arise from living one's life in a particular sociocultural context structured by certain meanings, practices, and institutions. People do not live generally or in the abstract: They always live according to some specific, substantive set of cultural understandings (goals, values, pictures of the world). Selfways thus include important cultural ideas, values, and understandings of what it means to be a self and how to be a good self. Selfways, however, are not just matters of belief, doctrine, or ideology, but are also manifest in everyday behavior, language practices, patterns of caretaking, schooling, religion, work, the media, and social episodes, both formal and informal.

The notion of selfways implies that every sense of self will be grounded in some shared meanings and customary practices and will necessarily bear some meaningful resemblance to similarly grounded selves. From

this perspective, to act, live, or function well in a given culture means practicing the underlying cultural views of how to be. Thus, although any two American selves will obviously differ in countless ways, as will any two Japanese selves, cultural participation in either current American or Japanese practices and institutions will produce some critical similarities.

Speaking probabilistically and in central tendencies, culturally acceptable European American selves are likely to be (a) separate, bounded, stable, and consistent; (b) attribute-based (e.g., based in traits, preferences, goals); (c) clear, confident, articulated, elaborated; (d) in control; (e) different from others and uniqueness-oriented; (f) particularly sensitive to positive regard, self-enhancing; (g) success-oriented; and (h) expressive and enthusiastic. Culturally acceptable East Asian selves are likely to be (a) connected; (b) context-based; (c) relational, flexible, malleable, responsive to others' expectations, preferences, and feelings; (d) similar to others and concerned with fitting in; (e) particularly sensitive to potential inadequacy, self-critical; (f) improvement- and mastery-oriented; (g) open, receptive; and (h) fully engaged.

From the moment of birth (and even earlier in some cultural contexts), individuals are given meaning and engaged as persons. Through this cultural participation, they become selves. An infant's mentality or way of being in the world is thus patterned according to the meanings and practices of a given cultural community, and the communities, in turn, are maintained by these mentalities. A continuous cycle of mutual attunement and coordination connects psychological tendencies with the social realities on which these tendencies are brought to bear. From our perspective, features of the cultural system, such as the characteristic ways in which one is led to focus on and attend to others, can become directly incorporated into individual systems of experiencing and organizing the world. They become selfways. As Ingold (1986, 1991) characterizes it:

> Like organisms, selves become, and they do so within a matrix of relations with others. The unfolding of these relations in the process of social life is also their enfolding within the selves that are constituted within this process, in their specific structures of awareness and response—structures which are, at the same time, embodiments of personal identity. (p. 367)

In the following section, we briefly review studies relevant to how selfways develop through cultural participation in the custom complexes characterizing European American and East Asian cultural contexts. We aim to highlight the diverse selfways that develop from such participation. Most of the recent research has focused on a contrast between patterns of cultural participation that construe the person as an independent, autonomous entity and those that construe the person as an interdependent part of a larger social unit. Some researchers suggest that variations on the interdependent pattern characterize about 70% of the world's population (Greenfield & Cocking, 1994; Triandis, 1989).

Selfways in Some European American Contexts

Speaking generally and probabilistically, the European American middle-class cultural region is characterized by selfways that promote independence of the self. Being a European American person requires the individualizing of experience. A person's subjectivity is sensed as a more-or-less integrated whole, configured by attributes and values distinct from others' or society's (see Geertz, 1984). The self is experienced as the individual's meaningful center and is understood to be rooted in a set of internal attributes such as abilities, talents, personality traits, preferences, subjective feeling states, and attitudes. A major cultural task often mutually pursued by caretakers, friends, and teachers is to continually, progressively individualize the child. As researchers become aware that conceptualizing the self as an object and describing one's self in abstract psychological terms are culture-specific tendencies rather than consequences of general cognitive development, they can investigate practices that afford these tendencies.

Despite an explicit cultural emphasis on being nice and caring and helpful (Bellah, Madsen, Sullivan, Swidler, & Tipton, 1985; Deci & Ryan, 1990), development in the European American style is almost synonymous with individualizing and decontextualizing the self. Even as people seek and maintain interdependence with others—social tasks that must be accomplished everywhere—they will maintain a sense of boundedness, relatively greater separation from others, and being in control. Caring, connecting, and relationality will likely assume a more individually agentic form. Many cultural practices that contribute to a sense of agency are so much a part of everyday, domestic life that they are, for all practical purposes, invisible.

In many English-speaking cultural communities, language use itself helps create the decontextualized, agentic

"I." Ikegama (1991) notes that English is a language "which focuses on the human being and which gives linguistic prominence to this notion, while Japanese is a language which tends to suppress the notion of the human being, even if such a being is involved in the event" (p. 301). In characterizing an event, English focuses on the particular person involved, but Japanese emphasizes the event as a whole, submerging the individual in it. Because the human subject is foregrounded in English, one might say "I have a temperature," but in Japanese, one would say roughly "As for me, there is a temperature" or "A temperature goes with me." The English phrase "John ran out of money" might become "As for John, money became null" in Japanese.

Along with foregrounding the subject (the "I") in English, American English speakers tend to be direct and assume that a speaker must make him- or herself clear to listeners. This tendency begins early. Compared to Japanese mothers, American mothers talk more, and more directly, to their children (Azuma, Kashiwagi, & Hess, 1981; Caudill & Weinstein, 1969). In a study of mother-infant interaction patterns, Morikawa, Shand, and Kosawa (1988) compared American and Japanese mothers interacting with their 3-month-old infants. Americans mothers elicited more vocalizations and exhibited more expressions of positive affect, and vocalizations occurred while mothers looked at the baby and the baby was happy and alert. This pattern contrasts with the Japanese studied who more often expressed negative affect and did so while the baby was looking away.

Direct, explicit verbal instruction characterizes teacher-child interactions in the American cultural context (Tobin, Wu, & Davidson, 1989; Wu, 1994). In such interactions, the child's distinctive attributes are identified, then persistently noted and affirmed. Personal attributes and abilities are assumed to define the self—to sustain one's uniqueness and drive one's current, past, and possible actions. The explicit goal is the development of individuals' potential. American institutions may realize the idea of defining attributes by grouping and tracking children according to ability (Stevenson & Stigler, 1992). When resources permit, the curriculum is often individualized on the assumption that each child has a unique learning style and pace.

The American schoolchild is objectified, made to feel special, praised, encouraged, and complimented. In many schools, children may be a VIP or star for a day or a week, celebrate their birthdays, and be honored (Markus & Kitayama, 1994a). Writing projects often involve autobiographies and personal narratives, and art projects focus on self-representation. Many middle-class American children are thus continually encouraged and given chances to express themselves and present their ideas in speech and writing. A common elementary practice in school is show-and-tell: Children bring items then stand before the class and tell a story about their object. All these everyday practices foster an objectification of self and a sense of self as a source of action (Heine et al., 1999).

Moreover, children are encouraged individually and collectively to think of themselves positively as stars, winners, above average, and the repositories of special qualities. It has become routine for every child who plays on a soccer or basketball team to receive a trophy. This practice may discourage competition or invidious comparison among team members, but it underscores the importance, not of the group, but of each individual. Even as many current educators worry that they may have used praise too liberally in the past and try to focus on the learning process rather than on evaluating the child (Damon, 1984, 1995; Damon & Hart, 1988), teachers are persistently urged to find some unique aspect of each child's product.

American children are also encouraged to be independent, autonomous, and self-determining (Bellah et al., 1985). Families in European American middle class contexts often give infants their own beds and bedrooms to foster autonomy (Shweder et al., 1995). Similarly, most developmental markers center on autonomous activity—rolling over, sitting up, walking, and eating by *oneself*.

Additionally, American children are socialized to have distinct preferences. Long before the child is old enough to answer, caretakers pose questions like "Do you want the blue cup or red cup?" Caretakers' questions signal to children that the capacity for independent choice is a necessary, desirable attribute (Markus & Kitayama, 1994a), and thereby instantiate an "ethics of autonomy" that prevails in certain cultural communities but not others (Haidt et al., 1993; Shweder et al., 1997). Moreover, the availability of choice necessitates preferences by which to make choices. Preschool settings are arranged such that children have an extensive choice of activities and need not conform to the group except during limited parts of the day (C. C. Lewis, 1995). Presumably, such efforts to incorporate self-determination into the school day are designed to safeguard the child's intrinsic motivation.

This is an instance of culture and psyche making each other up. Particular kinds of psychological processes (e.g., construing the self as a positive, unique entity) emerge through years of socialization and enculturation as an individual receives then perpetuates social practices and meanings recurrent in a given cultural community (Kitayama, Markus, Matsumoto, & Norasakkunkit, 1997). These psychological processes, in turn, reproduce those same cultural patterns. Becoming a self (a meaningful cultural participant) in a European American context thus involves maintaining an autonomous self separate from other selves and the social context. Those with such independent selves may be more attuned to positive characteristics of the self, and may be especially motivated to discover them, express them in public, and confirm them in private. They often develop processes to buoy their own self-esteem.

The data on European American selves in middle-class contexts support these generalizations. Examining earliest childhood memories and self-reports, Wang (2001a) found that Americans described themselves using individual attributes and reported lengthy, specific, self-focused, and emotionally elaborate memories. Chinese self-reports were briefer and respondents described themselves by roles. Their memories centered on collective activities, general routines, and emotionally neutral events.

In a series of studies with young children, Hart and his colleagues (Hart, 1988; Hart & Edelstein, 1992) asked American children to imagine a "person machine" that makes the original person (respondent) disappear but at the same time manufactures other people (copies of the original) who receive some, but not all, of the original person's characteristics. The respondent's task is to judge whether the new manufactured person with the same physical attributes (looks like respondent), with the same social attributes (has same family and friends), or with the same psychological attributes (same thoughts and feelings) will be most like the original person. They have found that by the ninth grade most respondents believe the copy with the original's psychological characteristics is most like the original.

Consistent with a number of earlier studies of the development of the self-concept (e.g., Harter, 1983), Stein, Markus, and Moeser (1996) have found that 11- to 14-year-old European Americans asked to describe themselves depict a consensual self whose attributes include being caring, friendly, nice, and worried. Moreover, the self-descriptions of adolescents with high rather than low self-esteem matched the consensual self more closely. Such findings suggest that adolescents' tendency to characterize themselves in abstract terms stems from a particular collective idea of "how to be" rather than from increased cognitive ability. These findings are consistent with several other studies on cultural variation in self-categorization (Cousins, 1989; Harter, 1983; Triandis, 1990), which suggest that internal features of the self—the traits, attributes, and attitudes—are privileged and regarded as critical to self-definition.

Furthermore, in a study comparing the self-efficacy levels of children from Los Angeles, East and West Berlin, and Moscow, researchers (Little, Oettingen, Stetsenko, & Baltes, 1995) found that children from Los Angeles had the most optimistic self-efficacy beliefs, while children from East Berlin had the most pessimistic beliefs about personal efficacy. The authors argued that the higher self-efficacy ratings of the Los Angeles elementary school students reflect the high levels of individualism and the low power distance between students and teachers.

Oettingen (1995) argues that efficacy depends largely not only on one's own evaluations in individualist cultures but also on evaluation by in-group members in collectivist cultures. In cultures with a large power disparity between members, children will tend to treat parents and teachers as clear superiors. Children in cultures with a lesser power disparity will have more opportunities to see themselves as "origins" of their own actions. It would be interesting to know how those children of Bielefeld, North Germany, who were reared to be hyper-independent and unspoiled (Grossmann & Grossmann, 1981, 1991; Grossmann et al., 1985; and see earlier discussion of culture-specific presuppositions in attachment research) would have fared on a self-efficacy index.

As researchers develop methods of assessing the selves of ever-younger children, they have found that apprehending and experiencing the world through bounded selfways begins quite early in individualistic cultural communities. European American children appear to have some sense of who they are and which attributes characterize them by 3 years of age (Eder & Mangelsdorf, 1997), and by 4 years of age they show psychological tendencies that reflect the cultural emphasis on individualization and separation from others. They describe themselves as better than their peers in all domains, and studies with adults suggest that this type of self-serving bias or false uniqueness correlates

positively with self-esteem (Josephs, Markus, & Tarafode, 1992). In a cultural system organized around promoting the individuality and uniqueness of the self, a general proclivity to positive self-regard has positive social and psychological consequences.

Selfways in Some East Asian Cultural Contexts

A rapidly expanding literature in psychology, anthropology, and philosophy now provides an increasingly nuanced understanding of the cultural form of Japanese, Chinese, and Korean selves. Systematic analyses of Japanese settings reveal a pervasive concern with and attention to the relational side of social life and to individual position in the social structure (Bachnik, 1994; Lebra, 1993; Peak, 1987; Rosenberger, 1992). Markus and Kitayama (1991a, 1991b) suggest that Asian selfways emphasize the fundamental relatedness of individuals to each other and that the relationship rather than the individual may be a functional unit of consciousness, and claim:

> Experiencing interdependence entails seeing oneself as part of an encompassing social relationship and recognizing that one's behavior is determined by, contingent on, and to a large extent, organized by what the actor perceived to be the thoughts, feelings and actions of others in the relationship. (p. 227)

Lebra (1994) argues that among the Japanese, empathy is a psychological mainstay and must be understood if one is to comprehend almost any aspect of Japanese behavior. Empathy (*omoiyari*) "refers to the ability and willingness to feel what others are feeling, to vicariously experience the pleasure or pain that they are undergoing, and to help them satisfy their wishes" (Lebra, 1976, p. 38). Lebra sees this focus as diametrically opposed to the self-focus common in many European American practices.

This emphasis on empathy implies that Japanese selves should not be conceptualized as lacking individuality or a separate identity or that autonomy is unimportant in Japan (Greenfield & Cocking, 1994; Kim, 1987; Oerter, Oerter, Agostiani, Kim, & Wibowo, 1996). It does imply, however, that such empathic ways of being a self, which explicitly highlight the state of being-in-relation, are different from selfways that emphasize and reify the individual. In this particular Japanese mode of being, subjectivity is sensed as interdependence with a larger whole that includes both the person and others and is configured by constantly referencing the self to the situational setting or context.

Throughout much of the world, the task of child rearing is not the European American one of making a dependent baby into an independent adult, but instead one of cultivating an unruly asocial baby into a civilized social being (Caudill & Weinstein, 1969). The need to uphold interpersonal obligations as well as to maintain connection and harmony with others is highly elaborated in every sphere of social life. Caudill and Weinstein (1986) find that Japanese mothers hold their 3- to 4-month-old infants more and have more body communication with them than mothers in the United States. Furthermore, as noted earlier, co-sleeping and co-bathing are common. Sleeping babies are rarely left alone in Japan. The close, fully interdependent mother-child dyad is particularly idealized in Japan, and many other relationships (e.g., between boss and subordinate) are organized around this familial model. Greenfield and Cocking (1994) characterize interdependent and independent developmental scripts as sharply contrasting, intertwined but never fully balanced. From an East Asian cultural perspective, a self European American style—distinct, positive, and attribute-based—is not a mature, fully civilized form of human agency. A strongly held, clear sense of self signals childishness because it entails failure to take full account of and show sufficient regard for the relationships of which the self is a part. Agency Japanese style results from (a) the sense that the self is afforded and appreciated through the relationships in which it participates, and (b) the sense that the self must flexibly maintain and further the welfare of those relationships.

Such a sense of agency does not mean that the self is passive or just going with the flow. Inter-individual harmony requires active attention. Mulder (1992), in describing Indonesian harmony (*rukun*), notes that it "does not come as a gift but is the result of the active orientation toward mutual respect and adjustment to each other." From this orientation, one must be empathic and flexible to avoid hurting or embarrassing others by one's action. Oerter et al. (1996), in characterizing a Japanese perspective on human nature, quotes a respondent as claiming that "adulthood" means "good understanding, being flexible and following the general rules set by society. The more you grow as an adult, the smaller your own private fantasy world becomes. . . . You become softer-minded, better fitted to the society, but you also become less sensitive" (p. 41).

Interdependence characterizes many different aspects of Japanese life. As noted previously, the Japanese language minimizes the person as an agent. Self-reference in Japanese is accomplished with an elaborated set of communicative customs based on individual status in each particular relationship. The Japanese word for self (*jibun*) means "my share of the shared space between us." Japanese-style interdependence emphasizes living correctly and self-improvement.

Even maternal practices toward infants in Japan seem to involve communicating correct and expected ways to be. Caudill and Schooler (1973) noted that Japanese mothers' speech is apparently aimed to shape directly their infants' physical and emotional states in normative directions. They seem especially concerned with preventing infants' crying and with calming babies whose serenity has been disturbed (Morikawa et al., 1988). Compared to European American mothers, Japanese mothers appear especially alert to infant vocalizations, which they often interpret as signs of distress to which they must respond (Bornstein, Azuma, Tamis-LeMonda, & Ogino, 1990). American mothers, by contrast, seem to talk more to their infants, without trying to directly influence their infants' behavior. Bornstein and colleagues cite a Japanese mother saying to her 3-month-old baby who was looking away ("What is wrong with you?" and "Look at me"). Apparently, to reestablish a dyadic connection when the infants were gazing away from them, Japanese mothers were more likely than Americans to express negative affect, try to establish mutual gaze, or seek information (see also Rothbaum, Pott, & Azuma, 2000; Rothbaum, Weisz, & Pott, 2000; Shimizu & LeVine, 2001).

Such East Asian parenting and teaching practices encourage interdependence through interaction and mutual engagement. When American mothers and toddlers interact with a new toy, American mothers typically focus on the object and draw the child's attention to it. Japanese mothers use the toy to engage the child in a relational or interactive game and do much less talking, explaining, and questioning (Bornstein et al., 1990; Fernald & Morikawa, 1993). According to Lewis's (1995) survey of over 50 Japanese preschools, the focus is on developing children's connections to one another and engaging them in the pleasures of group life. Instead of celebrating individual success, special events recognize the whole group. Children routinely produce group pictures or storyboards, and no child may go to the playground until all are ready. Attention to others is among the primary aims of Japanese education and is fostered in many routine practices. Classroom walls are adorned with group goals, such as "let's cooperate" or "let's pool our strength" (C. C. Lewis, 1995).

Similarly, Chinese parents and teachers consider developing a sense of connectedness to be essential for children's socialization. Child-rearing practices focus on obedience, reliability, proper behavior, social obligation, and group achievement (P. J. Miller et al., 1997; Mullen & Yi, 1995; Wu, 1996). In a study that content-analyzed children's stories and early memories, Wang and Leichtman (2000) found that compared to American children, Chinese children showed greater orientation toward social engagement, a greater concern with moral correctness, greater concern with authority, a less autonomous orientation, more expressions of emotion, and more situational details. To illustrate these differences, Wang and Leichtman provided the following examples from 6-year-olds:

> Memory 1 (American boy): When I didn't get to get a toy. I like to get lots of Legos and there was an underwater one, and it was a little big. It was a medium one and it had one of the things I've been waiting for. But I forget what it was.
>
> Memory 2 (Chinese boy): One day, my mom bought many flower seeds. They were alive. She planted them there. I stepped on them by accident. Then my mom scolded me and spanked me twice. So I cried. I felt a little angry that she spanked me.

Differences by cultural context are especially evident with respect to emotions (Mesquita, 2001; Tsai, Simenova, & Watanabe, 1999). In many middle-class European American contexts, emotions constitute an important aspect of the self and should be emphasized and explained as one develops individuality. In Chinese contexts, emotions result from the child's relations with significant others and serve to both encourage proper behavior in the child and reinforce a sense of connectedness (Wang, 2001b).

Studies of East Asian child-rearing and schooling practices also suggest an emphasis on knowing one's place, role, station, and duties in the social order, particularly in Chinese cultural contexts that explicitly value self-improvement, order, and hierarchy. In a study of Chinese American and European American mothers' beliefs about what matters for raising children, Chao (1992) found that Chinese American mothers stressed sensitivity to other's expectations and the situation, while European American mothers emphasized nurturing the child's

sense of self. Here the former were primarily concerned with the hierarchical, interdependent relationship between self and others and the integrity that derives from doing your duty, but the latter were primarily concerned with furthering their children's independence and encouraging a strong, positive, even assertive, self-regard.

Chao (1993a, 1993b) found an emphasis on order and respect for hierarchy among Chinese American mothers. They scored higher on scales of parental control, authoritarianism, and what Chao calls "Chinese child-rearing ideologies" than their European American counterparts. These Chinese American mothers were more likely to endorse items such as "I have strict, well-established rules for my child," "I do not allow my child to question my decisions," "I make sure I know where my child is and what he is doing at all times," "I teach my child that in one way or another punishment will find him when he is bad," "Mothers can teach children by pointing [out] good behavior in other children," "When children continue to disobey you, they deserve a spanking," and "Children should be in the constant care of their mothers or family members."

Similarly, Rohner and colleagues found that, in contrast to Americans, Korean adolescents perceived parental control as manifesting not hostility and mistrust but love and concern (Rohner, 1984; Rohner & Pettengill, 1985). Notably, strictly controlling parental practices that aim to create a morally dutiful, disciplined sense of agency are also found in some European American contexts and merit further study.

Differences in selfways also come across in play practices. Farver, Kim, and Lee (1995) found that in free play among European American and Korean American preschoolers, European American children primarily described their own actions, rejected their partners' suggestions, and used directives (e.g., "I am your king! Do not obey the bad king! I'll save you!"). Korean American children described their partners' actions, used tag questions, semantic ties, statements of agreement, and polite requests (e.g., "He is a king, isn't he? He's the bad guy, isn't he? The good guy caught him, right?").

Overall, in many East Asian contexts, personal sense of well-being is tied less to meeting an individual's goals (the ethics of autonomy) and more to doing what is required in a given situation, or doing something the right or appropriate way (ethics of community; for more on the ethics of autonomy and community see Shweder et al., 1997). Already in the first months of preschool, Japanese children are required to perform complicated activities, such as arranging their lunch boxes or putting on their clothes for outside activities, in the required way (Peak, 2001). As a child, being part of a family or a school group often means thinking about the social unit and your place in it, and then doing what is proper for this situation. It involves considerations such as "What do my parents or my peers want me to do?" or "Did I do what they wanted me to do?" In a Japanese cultural context, a sense of self is developed by being finely attuned to the expectations of others, by not being left out of their sympathy, and by making sure you are part of the social process. Perceptually, cognitively, emotionally, and motivationally, others—the encompassing social unit, the group and its standards of excellence—are important. Thus, the most useful kind of information about the self concerns your shortcomings, problems, or negative features. Self-criticism is encouraged in all societal settings from the classroom to the boardroom. Cultural participation entails discovering what may be lacking in your behavior and then closing the gap between the actual and expected behavior (Kitayama et al., 1997; Markus & Kitayama, 1994a, 1994b).

In Japan, a constant focus on social expectations and meeting them appears to go hand in hand with a simultaneous focus on self-improvement and self-criticism. In studies comparing self-improving and self-enhancing motivations (Heine et al., 1999, 2001), Japanese participants who failed on an initial task persisted more on a follow-up task than those who succeeded. In contrast, North Americans who failed persisted less on a follow-up task. In Japanese contexts, failures are important and diagnostic and thus serve to highlight where corrective efforts are needed. The emphasis on self-improvement as a virtue can be seen everywhere in Japanese life. An advertisement urging Japanese workers to take vacations exhorted, "Let's become masters at refreshing ourselves" (*New York Times,* May 1995).

The desire for self-improvement has cognitive consequences: Many Japanese tend to focus on areas needing improvement while discounting positive aspects of their performance. This tendency to discount the positive is often misinterpreted by European Americans as self-depreciation, but in Japan it works very well to establish the person as a community member in good standing. Humility might better describe this culturally valued disposition. In contrast to European Americans, who often focus on a self's positive features and equate self-improvement with individual achievement,

Japanese are more sensitive to a self's negative features in a given context.

Further, Japanese practices are often framed in terms of *hitonami* (average as a person). Difficult as it may be for European Americans to believe, many Japanese feel relieved to know that they are average because being different entails the risk of being insensitive to and not belonging in your community. From an interdependent perspective, the self seems best described as a process of self-improvement that requires being sensitive to the expectations of others and not disrupting harmony or equipoise.

Studies of self in Asian contexts all point to self-criticism as integral to the self. Chinese respondents answer the Twenty Statements Test using fewer positive statements about themselves than Americans do (Bond & Cheung, 1983; Karasawa, 1998). Ryff, Lee, and Na (1995) also found that Korean respondents were more likely to endorse negative than positive statements about themselves; European American respondents showed the reverse pattern. Stigler, Smith, and Mao (1985) found similar results among Chinese and United States elementary school students' perceptions of competence: Chinese students rated their competence lower in cognitive, physical, and general domains than did European Americans.

These studies suggest that members in good standing in Asian cultural contexts avoid calling attention to the self, deemphasize their own specialness, and adjust to the immediate situations in which they participate. Even the universally necessary social tasks of individuation, independence, and maintaining autonomy are grounded in an appreciation of interdependence.

These orientations exist at odds with the very practice of personal self-description and thus with commonly exported social science methods requiring people to evaluate and categorize the self. Interdependent (or sociocentric) and individualistic (or independent or egocentric) mentalities and practices are distinct and may require different methods of study. Considered in their respective cultural contexts, notably, these two selfways are equally normal, reasonable, or viable ways of being, although they are associated with patterned or systematic diversity in psychological functioning.

Both types—individualistic and interdependent selfways—involve the participation and support of others and are saturated with cultural meanings. The instantiation and realization of individualism is then a type of interdependence and a socially endorsed and constructed cultural practice. As Vygotsky (1987) suggests, "Every function in the child's development appears twice; first on the social level, and after on the individual level, first between people (interpsychological) and then inside the child (intrapsychological)" (p. 57).

Selfways in Still Other Cultural Contexts

We have focused on the comparison *between* European American and East Asian children to highlight divergent selfways. Nevertheless, important variations in selfways can also be found *within* cultural groups and are increasingly a focus of attention (Strickland, 2000). For example, Harwood and colleagues (Harwood & Miller, 1991; Harwood, Schoelmerich, Ventura-Cook, Schultz, & Wilson, 1996) compared Anglo and Puerto Rican mothers in the United States. They found that relative to Puerto Rican mothers, both middle- and lower-class Anglo mothers placed significantly greater value on self-confidence and independence and significantly less value on obedience, the capacity for relatedness, and proper demeanor. Miller, Potts, Fung, Hoogstra, and Mintz, 1990; Miller and Hoogstra, 1992; Miller, Mintz, Fung, Hoogstra, and Potts, 1992, report that autonomy is important in both working-class and middle-class U.S. communities, but is fostered differently according to social class. In a study of the co-narration of mothers and toddlers in two Midwestern communities, they found that middle-class mothers accorded children speech and author privileges in creating stories about past events, and were less likely than working-class mothers to challenge the toddlers' versions of reality. Working-class mothers also granted children speaker rights—and involved children in longer co-narratives than middle-class children—but challenged children more often to tell the "correct" version rather than their own story. Similarly, recent ethnographic accounts of selves in working-class contexts find less focus on self-confidence, self-expression, and developing potential and more emphasis on stability, integrity, and resilience (Harwood, Miller, & Irizarary, 1995; Kusserow, 1999; Snibbe & Markus, 2004).

A study by Rogoff et al. (1993) comparing U.S. middle-class and Guatemalan Mayan toddlers finds that autonomy also matters in the socialization of Mayan children, particularly among toddlers who are accorded special privileges and not expected to conform to the same rules as older siblings. In contrast to the American children, however, older Mayan siblings cooperated

interdependently with the toddlers without caregiver intervention, suggesting that among the Mayans developing autonomy is associated with understanding that one is an interdependent member of the community and is not as completely autonomous as infants are allowed to be.

Only recently have investigators began to describe how contexts other than European American and East Asian ones influence the constitution of self. For example, a review of parenting among U.S. Latino families finds that despite considerable within-group heterogeneity, Latino parents tend to emphasize the main cultural values of *respeto* and *familismo* (Harwood, Leyendecker, Carlson, Asencio, & Miller, 2002). *Respeto* refers to maintaining proper demeanor, which involves knowing the proper decorum required in a given situation with people of a particular age, sex, and social status. *Familismo* refers to a belief system linking loyalty, reciprocity, and solidarity toward members of the family, which is seen as an extension of the self (Cortés, 1995).

African American parenting, according to a review by McAdoo (2002), must often address persistent issues that African American children confront, such as devaluation of their own worth and future potential, inadequate financial resources, and the challenge of teaching children about race. Moreover, in African American contexts maintaining communal family traditions is essential. Coresidential extended families and their support systems are common and regarded as an important survival system for African American families (Hatchett, Cochran, & Jackson, 1991).

Research in cultural psychology challenges some generalizations about self and self-development and significantly strengthens others. In the next decade, these shifts will likely result in new paradigms for studying the self. Recent theoretical debates and discussions in psychology and anthropology aim to clarify and elaborate the general propositions that the self is (a) constituted in interaction with others, (b) collectively constructed through sociocultural participation, and (c) a product of history (see Elder & Shanahan, Chapter 12, this *Handbook,* this volume). Each of these propositions reflects a central claim of cultural psychology, namely, that processes of self-functioning encompass not only a single psychology but also multiple psychologies.

The Self Is Constituted in Interaction with Others

It is an old idea that one cannot be a self by one's self. Although life in the middle-class European American cultural region has highlighted the conceptual self, studies of self in other cultural locations underscore the importance of what Neisser (1988, 1991) terms the *interpersonal self.* Selves are constituted and develop in interaction with specific others (J. M. Baldwin, 1911; M. W. Baldwin & Holmes, 1987; Cooley, 1902; Hallowell, 1955; Ingold, 1991; Rosaldo, 1984; Shweder & LeVine, 1984). Echoing Mead (1934) and the early symbolic interactionists, the self literature includes a growing appreciation of the dynamic, socially constructed nature of self. This idea has the appeal of potentially bridging the gap between focusing primarily on the individual as a cultural learner (Tomasello et al., 1993) versus on the cultural collective of which the individual is an interdependent part (Cole, 1995). This synthesis promises to get the person back in the practice and the practice back in the person.

Efforts to understand the mutual constitution of self and other in the development of self, or just how it is that selves and others make each other up, are ongoing. Outside of middle-class European American cultural communities many people prefer crowded living conditions and regard the physical presence of others, especially family members, as essential to mental health and well-being. Peak (1987), writing about Japan, claims that becoming a person involves learning to appreciate the pleasures of group life and living in human society. Similarly, Ochs (1988) reports that Samoans are self-conscious about their need for others to acknowledge and sympathize with them. Menon's (1995) interviews with Oriya Hindu women living in extended joint family households reveal that in local moral worlds steeped in an ethics of community the idea of living alone while sane and happy is almost a contradiction in terms (see also Kakar, 1978).

In much European American research on the development of self, others become relevant when selves learn to take the perspectives of these others and get inside their heads (Flavell, Green, & Flavell, 1995), or as specific relationships are forged with particular others. It is increasingly evident, however, that others have a pervasive impact on any person's psychological development throughout life in all cultural contexts. Even prior to birth, individuals are immersed in social relations and activities. Human infants only become selves through their engagement in particular, culturally organized settings (Markus et al., 1997; Weisner, 1982, 1984, 1987). Ever more investigators now assume that mutual involvement of self and others is so fundamental to human functioning that others are automatically perceived as relevant to one's sense of self. Gopnik (1993) refers to an innate bridge or intersubjectivity between self and

others. Infants are responsive to others' affective expressions, and thus others are immediately expected, implicated, and involved in one's becoming a self (see also Ingold, 1991).

The Self Develops through Sociocultural Participation

A cultural psychology perspective places considerable emphasis on what Kitayama and colleagues (Kitayama, Markus, Matsumoto, & Norasakkunkit, 1995; Markus et al., 1997) term the *collective construction of self*. The concept is that selves develop in a dynamic, recursive process in which sociocultural participation in a given cultural system of meanings, practices, and institutions affords characteristic tendencies of the self that further serve to integrate the person into the meanings and practices of a given cultural community (see also Bourdieu, 1972; Giddens, 1984; Martin, Nelson, & Tobach, 1995). This perspective emphasizes that from their earliest moments, selves arise from being a person in particular worlds. From a child's earliest days, partial, incomplete, rudimentary gestures and vocalizations are "infused with specific meanings and significances crucial to enabling the child to become a progressively more competent partner" (Bruner, 1993, p. 532). Children are immediately engaged in the settings of daily life and are subject to the specific normative expectations and the institutional entailments of what Super and Harkness (1986) label a "developmental niche." People always live in culture-specific ways. To live otherwise is impossible.

Super and Harkness's theorizing is one of many attempts to resolve the tension between psychology's excesses in viewing development as natural growth or an unfolding of abilities in stages and anthropology's excesses in viewing development as cultural molding or conditioning. Super and Harkness claim that a child's developmental experience is regulated by (a) the settings—physical and social—in which the child lives; (b) the customs of child care and child rearing; and (c) the mentality of the caretakers. These three mutually interactive subsystems function together with other elements of the large culture and environment to constitute a culture-specific child.

Cultural psychology's approach to the study of self does not deny the individuality, idiosyncrasy, and uniqueness of the self observable in even the most tightknit and coherent collectives. Children do not become general people; they become particular persons or selves. One of the most significant facts about us, writes Geertz (1973a), "may finally be that we all begin with the natural equipment to live a thousand kinds of life but end in the end having lived only one" (p. 45). Every person participates in combinations of significant cultural settings or niches, which in contemporary American society could include specific groups, such as the family or workplace, as well as contexts defined by ethnicity, religion, profession, social class, gender, birth cohort, and sexual orientation. Some of the remarkable variation among people arises at least in part because people are unlikely to participate in identical configurations of group memberships. Even those living in similar configurations of cultural contexts will diverge in the specifics of their everyday, symbolically mediated experiences and due to prior, innate, received, or temperamental differences in their sense of self will differentially attend to, seek out, elaborate, or reflect some features of these experiences and not others. Moreover, participation or engagement in the activities of a given cultural setting can assume divergent forms. Cultural participation can be straightforward and unquestioning, resistant, or ironic. Consequently, there is little danger that people of the same sociocultural and historical niches will be clones of one another. Between-group differences do not imply within-group homogeneity.

The Self as a Historical Product

A cultural psychology approach to the development of self has led researchers to appreciate Bourdieu's idea that processes of self are "history turned into nature" (1991, p. 7). Many Western researchers focusing on the self have participated in their discipline long enough now to have observed historical change in the European American cultural zone in the natural and normative self. In the late 1960s and early 1970s, there was a need to discover the true self and feelings. Currently, there is the need to say no not yes to experience and to create the proper self. Many current self researchers were themselves raised according to the dictates of Dr. Spock but as parents find his prescriptions rigid and inappropriate. Similarly, American educators note that requiring children to be happy and feel good about themselves has produced a generation of children with high self-esteem and no basic skills. Programs under development aim to raise the educational expectations for American children and to replace an emphasis on positive self-evaluation with an emphasis on building specific skills (Damon, 1995).

General societal imperatives of "the way to be" promulgated by the advertising industry and media have

a strong effect on nurturing practices and on both lay and scientific conceptions of self. In a comprehensive historical overview of the American self, Cushman (1995, p. 24) argues that to understand the formation of the American self one must understand the interplay between this nation and what it means to be American, between what it means to be an American and what it means to be human, and between the construction of the self and the construction of the country. It is of no small significance to the renewed field of cultural psychology that self researchers are beginning to heed Kessen's claim (1983):

> The study of children is not exclusively or even mainly a scientific enterprise in the narrow sense but stretches out toward philosophy and history and demography. If we were to recognize such an expanded definition of child study, we might anticipate a new (science) whose object of study is not the true child or a piece of the true child but the changing diversity of children. (pp. 37–38; see also Bronfenbrenner, 1979; Bronfenbrenner, Kessel, Kessen, & White, 1985; Kessel & Siegel, 1983; Lerner, Chapter 1, this *Handbook,* this volume)

CULTURAL PSYCHOLOGY AND COGNITIVE DEVELOPMENT

In the previous sections, we have been considering some selected content areas, using these to bring out features of cultural psychology and to demonstrate how these alter our understanding and analysis of development, influencing concepts, methods, and research questions. Those content areas have had to do with interpersonal relations during childhood, language and communication practices, and the development of self. The fourth and last area chosen is that known as cognitive development. Terms with a cognitive cast to them—*mind, mentality, meanings, understandings, competencies*—have already appeared throughout the chapter. The area of cognitive development, however, gives them a particular place and deepens their analysis.

The material is necessarily selective. We have given preference, however, to proposals and issues that alter our views not only of cognitive development but also of development in general, and that focus on concepts, researchable questions, and possible methods. Structurally, the section is in three sections, each concerned with ways of moving beyond constraining divisions.

The opening material—on separations between thought and action—focuses on links between ways of thinking and ways of acting, on the nature of activities or practices, and on the concept of participation. The section that follows—reexamining separations between hearts and minds—links ways of thinking to feelings, values, and identities. To the analysis of cognitive development, the argument runs, we need to bring the study of accompanying feeling states. We need also to add the recognition that areas of competence and ways of learning differ in the extent to which they are seen as important by the individual or by others, and in the extent to which they are seen as appropriate to a person's current self or possible selves.

For the third large concern—moving beyond traditional separations between persons and contexts—the material is in two parts. Both stem from the challenge of giving specific shape to the general recognition that persons and contexts make each other up. The first starts by considering changes in approaches to the specification of contexts, asking how these fit with views of cognitive development. Here we give special attention to accounts of contexts as both exerting pressure and allowing innovation, as changing rather than static, as heterogenous rather than monolithic and as composed of contested or competing positions, with room for individuals to negotiate what is to be learned or what may be questioned. The later part starts by considering changes in accounts of cognition and cognitive development, asking how context enters into these. Here we give special attention to accounts of cognition in contrasting domains (domains where biological predispositions are major and domains where the bases is more one of gaining expertise), to the nature of expertise, and to the specific role of language and communication in an area—the area known as "theory of mind"—where age-related changes have been seen as biologically based, with little impact from sociocultural experience.

The brief final comments then bring together some comments on the methods highlighted by a cultural psychological perspective: Methods applicable to all aspects of development but particularly illustrated by studies of cognitive development.

Reexamining Thought and Action

The conventional assumption is that the mind comes first. Thought precedes action, at least as an ideal in development. We then find it reasonable to account for

what people do in cognitive terms. To take an example from law, we find it reasonable to ask if children are old enough to know the difference between right and wrong and, given that knowledge, whether they can be held responsible for what they do. We also see it as appropriate, in studies of development, to place our emphasis on changes and variations in the way people think rather than on changes and variations in what they do.

That conventional assumption has been questioned on several grounds. Noted especially in the previous edition were two alternative proposals. The first is that we reverse the usual order, with the flow now from actions to thought. To take a well-known example, we begin by "doing gender." We use, and see others use, different names, games, clothes, spaces, and tasks for males and females. Those everyday practices provide the bedrock for the category of gender. They lead us also to think of gender distinctions as fixed and natural, and they move development in the direction of less reflection rather than more.

The second proposal is that we specify both contexts and the course of development in activities, practices, and the nature of participation. In one society, for example, the main activities for children may be strongly age-graded, with each school group or playgroup made up of children much the same age, and children usually distanced from adult activities. In another society, school-based activities may play a minor role, younger and older children may be more often part of the same group, and children may be present while adults work, talk, or play.

The main directions seen as prompted by those proposals took the form of closer looks at (a) links between particular ways of thinking and particular ways of acting and (b) ways of specifying the nature of activities, practices, and forms of participation. We now take up those directions, asking what has been added since the previous edition, and highlighting some particular gaps that remain.

Examining links between ways of thinking and ways of acting. A view of actions and ideas as intrinsically interwoven is a core part of the concept of custom complex. The challenge lies in finding ways to bring out the forms of that interweaving. Two ways of doing so may be distinguished. One starts from particular forms of activity and asks about associated ways of thinking. The other starts from ways of thinking and asks what practices or activities might establish or maintain them.

For the first method—starting from particular forms of activity—this chapter has already provided a major example. It takes the form of working from language and communicative practices, asking for example how these are associated with particular divisions between truth and fiction, particular distinctions among relationships or events, and particular ways of perceiving or representing the self. That direction is also very much evident in analysis of the extent to which an understanding of "mind" and of what others know or believe is shaped by the presence of lexical terms such as thoughts or beliefs, by adults' questions to children, and by games such as I Spy or 20 Questions. In acquiring adults' language, the argument runs, children also acquire their theory of mind (e.g., Vinden, 1996; Vinden & Astington, 2000).

For a further example involving language, we turn to a study that is especially relevant to the under-explored question: What ways of acting can substitute for one another? We surely learn to distinguish among relationships, for example, by more than one route, by involvement in or exposure to more than one kind of practice. The nature of interchangeability, however, is so far poorly understood. The content area in the study singled out has to do with narrative development. It compares hearing children whose parents are deaf with other children. Narrative development turns out to be the same for both (Van Deusen-Phillips et. al., 2001). The narrative practices of people other than parents, it appears, are sufficient to model the expected structures.

Spoken language and communicative practices are by no means the only practices to attract continuing attention in the study of cognitive development. Anthropology and cultural psychology draw attention to a variety of other tools, ranging from sticks to written scripts, number systems, or maps: Tools that bring out the nature of both cultural variations and historical changes. There are by now many analyses of how various tools come to be available, used, or altered and to shape the way thinking or problem solving proceeds. Several of these are contained in the papers brought together by Cole, Engeström, and Vasquéz (2000). A set of chapters edited by Hatano and Wertsch (2001) provides several further examples, ranging from the use of a globe in learning about astronomy (Schoultz, Säljö, & Wyndhamn, 2001) to the use of models or diagrams in planning constructions (Gauvain, 2001).

From these several sources, we abstract two points that may well be extended to the analysis of many practices. The first is that with extended use we are likely to learn more than how to use a particular kind of tool. We may also develop an understanding of it, a mental model

of how it works, and its possibilities (Oura & Hatano, 2001, describing a particular aspect of development in the course of learning to play the piano). The other is a strong reminder that all such understanding is socially shaped. What is written and used as a basis and purpose for reading, for example, may in some groups cover a wide range of material and of situations. In others, materials and purposes may be strictly limited to writing certain kinds of letters, keeping certain kinds of accounts, or developing religious commitment (Scribner & Cole, 1981).

For the second method—starting from a way of thinking and asking about its possible background—we single out, as a particular case, thinking that involves the emergence of change or innovation.

There are, for example, clearly occasions when people develop ways of being original or creative rather than being only technically and reproductively expert. That kind of development appears to be influenced by the ways in which forms of teaching and definitions of skill allow some individuality of expression rather than only the strict following of prescriptive directions. Cooking and the performance of music, for example, often allow for some individuality of expression—at least at some levels of competence more readily than do areas such as the feeding of animals or plants (Hatano & Inagaki, 1992; Oura & Hatano, 2001).

There are also clearly occasions when reflection, questioning, or resistance occurs rather than the simple acceptance of a customary way of thinking or acting. Most analyses of practice lead us away from exploring that aspect of development. They emphasize instead the extent to which the routine, everyday quality of practices diminishes the likelihood that they will be reflected on, questioned, or resisted. That emphasis has offered a powerful contrast to accounts of cognitive development that emphasize people as making sense of the world in optimal scientific fashion: asking questions, being quickly alert to discrepancies, and investing effort in resolving ambiguities. It leaves open questions about shifts in conventional views and practices, both across generations and in an individual's lifetime.

For the circumstances that encourage questioning or resistance, we have so far little developmental evidence. One relevant circumstance, however, seems likely to be what children learn about the fate or status of questioners. They may be pointed out as odd people, as godless or lost souls whose afterlife is not what one would aspire to. "Curiosity killed the cat," it is said (more often than the rejoinder "Information brought it back").

A further possible circumstance has to do with repetitions of the same message. Repetition in itself, however, is a concept still in need of unpacking. It may take the form of everyone delivering the same message. There are, for example, experimental studies showing that consensus—especially consensus about the affective significance of a particular view—tends to limit the degree of monitoring for exceptions (Frijda & Mesquita, 1994). Repetition may also take the form of the same message emerging from several practices. Involvement in Western-style schooling, for example, is low among Samoan children. Both adults outside school and the nature of school practices in Samoa, however, all convey the same message: the irrelevance of school for the children's current or future ways of living (Watson-Gegeo, 1993).

In specifying activities and forms of participation or nonparticipation, any approach to development that emphasizes the importance of activities needs to move toward distinctions among them. Activities have been distinguished by, for example, where they take place, the people who are present, and the psychology of the people present (e.g., their views of how development takes place; e.g., Super & Harkness, 1986). They have also been distinguished by the tools or artifacts that are available or used (e.g., Gauvain, 2001), the patterns of accompanying talk (Gutiérrez, 2002), and the forms and impacts of repetition (e.g., Hatano & Inagaki, 1992). Practices, for example, are activities where repetition, by oneself or others, gives rise to the sense of the natural or proper ways to act (e.g., Goodnow et al., 1995; P. J. Miller & Goodnow, 1995).

Activities may differ also in the extent to which they allow various forms of participation. We draw particular attention to this aspect. One reason for doing so is that changes in participation have been proposed as promising ways of characterizing the forms that development takes. They may then characterize both the shape and the bases of development. Another is that descriptions of participation build on descriptions of activities as joint and on distinctions among them as how two or more people contribute to a task.

Currently, the most familiar form of attention to changes in participation revolves around teacher-learner or expert-novice relationships. Prompted, especially by Vygotskian theory, the course of development is often seen as one in which the expert provides guidance and structures the task in ways that allow the novice to take over more and more responsibility for the task.

That description of a shift is a rich starting point, but it needs, several expansions that involve (a) the kinds of

relationships considered, (b) the steps or processes involved, and (c) the nature of nonparticipation.

On the first score (the nature of relationships), we need to continue questioning the benign and cooperative quality presented as typical of teacher-learner relationships. Teachers or experts are not always eager to give up their control and novices are not always eager to learn or to take on responsibility (Goodnow, 1990b). Teacher-learner relationships are also not the only forms of relationship that can apply. In some situations, for example, people function or are expected to function more as a team. In still others, one person (e.g., a concert pianist) may seem to take the only active part. Even here, however, the audience listens with expectations about what will be played and how pieces will be played. The performer will take those expectations into account and also try to persuade the audience that the choice of pieces or of interpretation is a reasonable or exciting one (Oura & Hatano, 2001).

For expansions on the second score (specifying steps or processes in participation), we turn to proposals from Rogoff and from H. Clark. Rogoff (2003) describes participation as involving two processes. In one, people seek to achieve some mutual understanding: for example, some mutual understanding of what each knows, what each seeks, what each understands the task to be. In the other, they seek to structure what each will do. They offer choices, invite some actions rather than others, or shape events so that some actions become more likely than others. In effect, they engage in some "mutual structuring of participation" (Rogoff, 2003, p. 287).

H. Clark's (1996) analysis starts from conversation or "language in use" as a prime example of "joint activity." His analysis is not developmentally oriented; however, it does suggest several new directions for developmental research. In any joint activity, Clark (1996) argues, we should ask what each person contributes and is expected to contribute, what they regard as their shared task, how they go about that task, and when some perceived limit to what they can do is reached. In a conversation between a telephone operator and a caller, for example, one person seeks information and the other provides it. Each person checks from time to time that the other has heard what was said, has heard accurately, that the information provided is what was sought and has been understood (in essence, "are you with me?"). Moves toward establishing mutual understanding (Rogoff, 2003) are not only a way of describing what people do but also an indication of a particular competence whose acquisition we might well seek to trace.

In any joint activity, to take a second part of H. Clark's (1996) argument, we should specify the rules, regulations, and etiquette that apply. In any team game, for example, people may be present as players, referees, coaches, fans, or observers. Each is expected to act within certain limits. Acting in violation of these limits incurs penalties. For any game also, the number of people and the rules for participation define the game. People can play football with fewer than the number of required players, for example, but then the game is no longer an official game. Varying the rules as to what each piece may do in a game of chess is also possible but the game is then no longer chess.

In any area, that kind of description suggests, the acquisition of skill may lie in learning both the rules of the game and the limits to which they can be pushed. We learn, for example, that some departures from the expected rules or procedures rule one out of the game while others are tolerated. We learn also that failing to observe the expected patterns (e.g., the patterns for conversations) may not rule one out of the game but is likely to result in fewer invitations to join in on later occasions.

Learning the collaborative rules (Goodnow, 1996b) seems likely to apply to many situations, from turn taking to story telling, school tasks, or teamwork of any kind. How children learn such rules, however, is still far from clear. An intriguing beginning is Martini's (1994) observation that young children who spend a great deal of time with older children (the older children are often their minders) learn quickly that their presence is tolerated as long as they do not interrupt the older children's games. Household tasks bring out a similar aspect of development. They also bring out the extent to which what needs to be learned or negotiated are the reasons for participating, the expected styles for doing so, and the limits to variations in what can be contributed (e.g., variations in what can be delayed, downsized, delegated, swapped, substituted, or taken over; Fuligni, 2001; Goodnow, 1996c, 2004b).

The third and last needed expansion that we single out has to do with the occurrence and the nature of nonparticipation. Most analyses of participation assume that participation always occurs, even at times—as in the example of a concert pianist's audience—when participation is not highly visible. What needs to be accounted for then are the timing and the shape of changes in the way people participate. Nonparticipation, however, can also occur, and may be encouraged in some areas, with attempts at participation regarded as forms of interference (Goodow, 1996a). Where it is encouraged, learning how

not to do so, in acceptable ways, may be a major part of developmental skill (Goodnow, 2004a).

At this point, before we go further in attempts to track down sources, the major need appears to be one of differentiating among forms of nonparticipation. People may, for example, be physically absent. They may stay away or drop out. More subtly, they may be present but unengaged in what occurs. Children may, for instance, participate in the sense that they stay in the classroom (they do not drop out physically). They are, however, uninvolved, uninvested, or not engaged (behaviorally, cognitively, or emotionally) in the formal work of the classroom. Increasingly, that kind of nonparticipation is attracting both attention and proposals to the effect that the difficulty may lie more in the nature of social and classroom contexts than in characteristics of the nonparticipants (e.g., Blumenfeld et al., in press). Delineating forms of nonparticipation, establishing how they come about, and finding ways to change them seems to be one of the next challenges to rise to in analyses of how thought and action are related to one another.

Hearts and Minds

Cultural anthropology has long contained an awareness that matters of the mind cannot be separated from matters of the heart. Feeling cannot be regarded as a separate state from thinking or treated simply as a force that provokes thought (Shweder, 1992). Forms of competence need to be regarded as the skills that communities value (D'Andrade, 1981). Development needs always to be framed by the social group into which one moves: for example, "Becoming a Kwoma" (J. W. M. Whiting, 1941). At issue, to take a statement that has moved into popular discourse, is the battle for hearts and minds.

Cognitive psychology has tended to cover a somewhat different set of concerns. A set of chapters on "affective minds," edited by Hatano, Okada, and Tanabe (2001), illustrates two recurring lines of approach. One focuses on the ways in which emotions influence the nature of processing, with effects ranging from what is attended to or given processing priority to how far information is sought. The other focuses on the ways in which aspects of cognition prompt various emotions, ranging from fear in the face of perceived threat to the way pride, shame, or embarrassment rest on some sense of self and of standards.

What does our cultural psychology perspective add to such analyses of hearts and minds? To consider that question, we take up the place of feelings, values, and identities, again summarizing very briefly the points made in the previous edition and asking what might now be added.

Feelings

The only point covered in the previous edition was the widespread recognition of the need to avoid a two-box approach to thinking and feeling. We now expand on that point in three ways.

One is the use of feeling states as a way of differentiating among shared points of view (D'Andrade, 1992). All members of a cultural group, for example, may hold the view that "everyone should help the poor" or that "each of us can be whatever we want, provided we work hard enough." For some members of the group, however, that idea may be held at the level of a cliché. For others, the idea may be held with a conviction that guides action when a choice arises. For still others, the idea may be held at a level that initiates action: We seek ways to implement it. How some ideas come to be held with various levels of commitment is clearly a question about development that still needs to be explored.

The second expansion has to do with occasions when some ways of thinking or problem solving give rise to strong negative emotions. These ways strike us as terribly wrong, as violating some basic principles, as—to borrow from others—unthinkable, heretical, or taboo (Fiske & Tetlock, 1997; Tetlock, Kristel, Elson, Green, & Lerner, 2000). These feelings may well be an important part of our sense of a major difference between cultures. They also suggest that people may be regarded not only as "intuitive scientists" but also as "intuitive theologians"(Tetlock, McGraw, & Kristel, 2004). That kind of proposal is not only an interesting challenge to any "cool scientist" view of cognition but also nicely linked to a useful method: presenting people with errors of various kinds (essentially variations of expected patterns) and exploring both judgments of seriousness and the kinds of emotions reported.

The third and last expansion to the place of feelings attracts attention because it also challenges conventional concepts and some particular methods. It has to do with variations in the level of attention paid to feeling states as part of understanding others. A study of attention to two aspects of words provides an example. Adult speakers of English and Japanese were presented with words that were pleasant or unpleasant in meaning, and spoken with either a smooth, round tone or a harsh, constricted tone. They were then asked to ignore vocal tone and judge whether the words are pleasant or un-

pleasant in meaning, or to ignore meaning and judge whether the tone was pleasant or unpleasant. Japanese speakers found the first task more difficult than English speakers did. English speakers found the second task more difficult than Japanese speakers did (Ishii & Kitayama, 2001). The course of development for that kind of difference would now be of interest to establish, with one possibility being that English speakers grow out of an initial sensitivity to tone and into a preoccupation with the lexical meaning of words.

Values

At first glance, it may seem strange to use the term *values* in relation to cognition. Values surely belong to accounts of social or moral development. Cognitive values are ubiquitous: embodied in distinctions between what we call basics and frills, significant problems and trivial pursuits, elegant and pedestrian approaches to a problem, original and regurgitated pieces of writing, and proper and odd ways of adding up numbers.

In the previous edition, we noted the ubiquity of cognitive values and raised the question: How are these acquired? What is the nature of such cognitive socialization (Goodnow, 1990a)? We can now offer three expansions: one related to where values occur, a second to how values are acquired, and a third to the range of value tags or value judgments that are made.

For the areas where values are salient, we focused in the previous edition on the nature of the end product: on what is to be learned, what is said, understood, written, or worked on. Values are also attached to particular ways of proceeding or learning. In many cultures, for example, learning by watching is valued over learning by doing (Rogoff, 2003). In any culture, teachers and students may also vary in the value they attach to various ways of learning. Teachers in many Western societies, for example, often favor a process of learning by exploring differences of opinion—by argument or by attempts at resolving different views. Pupils, however, often devalue that procedure and avoid it on the grounds that it may jeopardize their relationships with one another (Lampert, Rittenhouse, & Crumbaugh, 1996). The values attached to play and to formal or academic learning provide a further example. Chinese parents of preschoolers place far less value on play as a source of cognitive development than European Americans. Moreover, their preschoolers themselves also place high value on learning in ways that suggest an "awareness of the unity of learning and morality" (Li, 2004, p. 126) that is slower to develop among European American children. The difference is seen as reflecting—for the Chinese preschoolers—a cultural model of learning in which a combination of "heart and mind for wanting to learn" is central (Li, 2002, p. 246).

For the acquisition of cognitive values, we turned in the previous edition to accounts that are essentially borrowed from theories of social learning. The emphasis was on what happens in dyadic interactions: on the way, for example, that what is said is responded to, built on, ignored, scorned, or actively corrected. We drew especially from accounts by Wertsch (1991) of how children even in the early years of school learn to use "the voice of science": sprinkling their stories or arguments with references to numbers, citing "evidence," and talking about the physical properties of objects rather their personal meaning for the speaker. Noted also were several closely observed accounts of what happens when children bring to school ways of speaking and story telling that are not in a teacher's preferred style. They are quickly made aware that their stories and their ways of story telling are not good, and teachers actively seek to dismantle (Michaels, 1991) the children's styles.

The ways in which we acquire cognitive values, however, need not be limited to such direct interpersonal interactions. Values are also embodied in practices. Take, for example, a school timetable or a school curriculum. In a timetable, some school subjects are allotted the prime times of day, taught every day, and seldom rescheduled. Others are given lower priorities: inevitably dropped or cut short whenever class juggling needs to take place. In the material used for teaching, there may be no references to a child's country of origin, no images of people from a child's identity group, or no stories that are part of a child's heritage. It may not even occur to kindergarten teachers that there is something absurd about using stories such as Red Riding Hood in Samoan classrooms (Watson-Gegeo, 1993). School subjects may also acquire various status tags: Some are thought of a must-be-taken course, some are only for the brightest (Latin and Greek once had this status), and some are best for the less bright (typing once had this status). Still others seem to exist on sufferance: In most secular Western schools, for instance, religion or scripture—if taught at all—is usually an option, and it is often taught by someone who is not part of the regular school staff. In many ways, its position parallels the low degree of attention given in most current analyses of development to religious ways of viewing events and people (Hudley et al., 2003). It is small wonder then that many of us are unprepared for the significance of religious thought in many other parts of the world.

Direct social learning and embedding in the teaching and linguistic practices of a group are then two lines of cognitive socialization. To these, a third needs to be added. It has been considered so far in terms only of judgments about the work of adults, yet is extendable to children. It also points to a way in which practices may be linked to one another: a recurring concern in this chapter. This core proposal is part of Bourdieu's (1979) analysis of intellectual values—of "taste" or "distinction": An analysis that brings out the extent to which some of the same criteria for judging value may apply in several situations. For example, we bring many of the same dimensions to judgments about intellectual productions that, we use for judgments about food, distinguishing between rich and thin, refined or rough, and well or poorly presented. The essence of taste for the European middle-class, Bourdieu (1979) comments, may well lie in the values it attaches to various forms of presentation, for both material and intellectual productions. That proposal not only helps illuminate an area of difference among social groups but also raises developmental questions about the extent to which a common presence makes values easier to pick up or more difficult to set aside in successive situations.

The third and last expansion in the area of values has to do with the range of value judgments. We have so far described various kinds of thinking, learning, or problem solving only as being more versus less valued, more versus less privileged. That is surely an incomplete description. At the least, we might extend the range by adding a term *dispreferred* from Ochs (1990, p. 299), which covers what is actively discouraged. We might extend it also by describing values as what is regarded as ideal, what is tolerated, what is discouraged, and what is regarded as out of the question, impossible, intolerable (Goodnow, 1995, 1996a), heretical, or unthinkable (Fiske & Tetlock, 1997; Tetlock et al., 2000).

We have a great deal to learn about what are regarded as the most serious violations of expected ways of thinking. Building on Fiske's (1991) account of social orientations, Tetlock and his colleagues propose that the underlying base is a violation of "spheres of exchange." With one example being the violation of a distinction between what can be treated as a commodity (traded, sold, or discarded) and what cannot. All cultures, for example, draw distinctions between what can be sold and what cannot. They may differ in their views of what can be sold (e.g., people, sex, loyalties), but the distinction is always deeply felt. We have as well a great deal to learn about the developmental background to such distinctions and the feelings associated with them. At the least, however, these judgments at the far end of a scale of values point to the need for expanding the range of value tags or value judgments among ways of thinking beyond any simple sorting into the more versus the less valued.

Identities

In the previous edition, we divided the argument for the need to link analyses of cognitive development to issues of identity into three ways, which break the line often drawn between analyses of cognitive development.

The first noted that certain ways of thinking, problem solving, or expressing oneself mark one as a schooled or educated person, promoting the choice of some ways of proceeding even when others are available (Nunes, 1995), and often provide the motivation needed to acquire a difficult skill (Hatano, 1995). The second was that changes in competence can lead to some changes in the identity that others assign to us. A person may now, for example, be recognized as a legitimate member of some community of practitioners (Lave & Wenger, 1991): a change in status noted as not always occurring. The third was that the acquisition of competence covers only part of the story. Not acquiring certain forms of competence can also be a way of signaling identity (e.g., an identity as one of "the lads"; Willis, 1977) or a way of protecting one's identity, one's sense of an essentially capable self (e.g., Cole & Traupmann, 1981). The critical skill may also lie in managing to maintain a double identity: for example, an official identity, for teachers, as a reasonable child who obeys the rules and, for one's peers, an identity as one who appears to stay in the letter of the rules but subtly bends or flouts them (Corsaro, 1992).

We have still a great deal to learn, as we noted in the previous edition, about the strategic presentation of identity in the course of development and about what is seen as in keeping with an assigned identity (e.g., the identity of child or beginner). Not in keeping with some definitions of a *child,* for example, is a precocious knowledge of sex or of money values. Not in keeping with some concepts of a *beginner* is the open and nondeferential display of skill or ease.

What might now be added? The expansions seen as especially needed have to do with (a) the nature of membership, (b) asking which members of a group matter, and (c) the implications of moves toward recognizing social and personal identity, multiple identities, and both a current self and possible selves.

On the first score (membership), developmentalists are now familiar with the argument that increasing competence needs to be seen as involving not only a change in the individual but also in the individual's coming to be an accepted, recognized member of a group. One needed expansion on that argument consists of noting that this second shift may not always happen. In a less-than-ideal world, acceptance may still be withheld. The official qualifications may never be enough. More finely, we now need to take a closer look at the meanings of terms such as *community* and *membership.*

Rogoff (2003) provides one example of that move, distinguishing participation from membership. She describes herself, for example, as having "participated for several decades in a Mayan community in Guatemala, but people from that community (and I) do not regard myself as a member of that community" (p. 83). We may, she continues, do better to focus on "the more dynamic concept of participation, rather than the categorical concept of membership" (p. 83). We may also need to think more about the defining features of a community. Communities need not, for example, be "limited to people who are in face-to-face contact or living in geographic proximity" (p. 81). They should, however, "be defined as groups of people who have some common and continuing organization, values, understanding, history, and practices. . . . A community involves people trying to accomplish some things together, with some stability of involvement. . . . A community involves generations that move through it, with customary ways of handling the transitions of generations" (pp. 80–81). Moreover, "participants in a community often continue to regard their involvement and their continuing relationships as central to their lives, whether this is expressed in affection or loyalty or efforts to avoid community ways" (p. 81). How people acquire these understandings of community and these feelings of belonging are questions still to be pursued.

On the second score (some people in a group matter more than others), we take as an example some proposals by Minsky (2000, 2001). Those proposals start by considering people as equipped by nature with "detectors" for praise or censure. The impact of praise or censure, however, depends on the extent to which there is an attachment or close relationship between the person making judgments and the person receiving them. The remarks of a stranger, for example, generate less shame than do the remarks of a parent to whom the child feels attached. The experience of emotions such as pride and shame, and the development of the standards, rules, and goals that M. Lewis (1993) sees as their basis, depend then on the development of attachments and, presumably, the range of people that in any culture are regarded as sources of praise or censure that should "cut to the quick."

The last expansion (closer analyses of identity) takes several forms. Each suggests a different facet of what develops and, in some cases, of conditions that shape cognitive development.

One is a distinction between social identity and personal identity. Personal identity is identity captured by asking whether people see themselves as competent or creative or as being the same person now that they were at an earlier age. Social identity refers to the social categories in which we place ourselves or others place us. We may, for example, describe ourselves as Asian American, Chinese, or Cantonese, or as first-, second-, or third-generation. Others may assign a person to a looser category, using a term such as *Asian* to cover everything from India to Japan. Interest in social identities and social categories has a considerable history, especially since the work of Tajfel (1981). Much of that work, however, has stayed in the realm of social psychology and in references to the life of adults. Increasingly, it shows signs of a much-needed move into analyses of development.

Seen as a mark of cognitive development, for example, is an increasing skill in the description of oneself in ways that fit what is required in various situations and with varied audiences (e.g., Banarjee, 2002). There are age changes, for example, in the appropriateness of children's answers on a task such as the following: "Imagine you are lost in a mall. I'm a detective and it's my job to find you. I've never seen you before and I don't have any pictures of you. Tell me what I would need to know about you to find you." What may also develop with age or experience is skill in shaping a presentation of identities to suit one's own strategic needs. To take an example from observations by Cooper, Garcia Coll, Thorne, and Orellana (in press) two girls in an Oakland school use to good purpose their *mixed* backgrounds (mixed is the term used in the school and the playground). For one, the mother is described in this report as Chinese-American, the father as Jewish. For the other, the mother is described as white, the father as Egyptian. Both girls were noted as using their mixed backgrounds as ways "to avoid fights (mixed meant not on either side of ethnically charged conflicts) or avoid the slight stigma of being

white and build alliances (I told the Black kids that I'm Egyptian and that's in Africa)."

A second expanded look at identity distinguishes between personal and collective identity. It is collective identity that is involved in the sense of "we" (Thoits & Virshup, 1997): reminiscent of J. W. M. Whiting's (1941) description of development as "Becoming a Kwoma." As Ruble and her colleagues point out, most of the work on collective social or cultural identity has been with adults. In contrast, most of the work with children has been on the developing sense of gender and gender constancy (Ruble et al., in press). There is some initial work on the extent to which a sense of racial constancy and a sense of gender constancy follow similar lines (Rhee, Cameron, & Ruble, cited by Ruble et al., in press). There is also the beginning of work on whether and when a sense of collective identity in children has similar consequences to those observed in adults (e.g., an effect on what is attended to and how information is processed, or—a point taken up in research with adolescents by Yip and Fuligni, in press—an effect from the strength of collective identity to successful coping with transitions such as changes in school).

A third expansion is the recognition of identities as multiple, especially when an individual occupies more than one social world: Most children occupy more than one world—home, school, and peers, for example. The children of foreign-born parents have been regarded as especially likely to occupy social worlds that differ markedly in their linguistic practices and values, with the inevitable development of a sense of being torn between two worlds. What they—and all children—may instead develop is a set of border-crossing skills that make it possible to negotiate a reasonably comfortable time in more than one place (Phelan, Davidson, & Yu, 1988).

A fourth and last move in analyses of identity is a distinction between a current self and future possible selves. What may matter most for performance or engagement in school, for example, may be not only an image of oneself at present but also an image of what one might become, and an awareness of the steps that need to be taken to achieve those futures. That kind of proposal not only makes intuitive sense but also is well supported by the results of a California program designed to provide the children of immigrant families with both an understanding of the paths they needed to take from one point in school to another (e.g., the particular levels in mathematics that they needed at various points) and a strengthened belief in their ability to move along the "pipeline," in their "identity pathways" (Cooper, Dominguéz, & Rosas, in press).

Much of this work is in its early stages. What is clear, however, is that these directions of research promise to yield a richer understanding of the ways in which issues of identity, along with feelings and values, are part of cognitive development.

Persons and Contexts

Salient in many areas of development is the issue of how to consider contributions from characteristics of both the individual and the social contexts in which they live. Surprisingly, an emphasis on both is still needed because there are still times when an emphasis on instruction or socialization seems to treat the individual as a blank slate or a sponge that needs only to have information provided in absorbable amounts. There are also times when an emphasis on the individual as actively constructing meanings seems to treat the outside world as essentially blank, ignoring the history and the directiveness with which individuals must work or make sense:

> Once both contributions are fully acknowledged, questions arise about how the two are interwoven. The first move has been a recognition of the need to regard "persons" and "contexts" as influencing each other in ways that are not one-directional, static or linear. The second has been toward some ways of specifying interdependence. Persons and contexts have been described, for example, as "creating each other" (Briggs, 1992), "shaping each other" (Cole, 1990), "making each other up" (Shweder, 1990a), or "co-constructing each other" (Valsiner, 1994).

What are the specific meanings of such phrases, especially in relation to cognitive development? To answer that question, we divide a large body of material into two parts, varying in their starting points. The first starts from several descriptions of contexts and asks what do these imply for the shape or course of development? The second starts from several descriptions of cognitive development and asks how do social or cultural contexts enter into these pictures?

Both parts start with the recognition that any description of either term (*context* or *individual development*) carries implications for the nature of the other. Ecological descriptions of context (e.g., the world as a set of nested circles starting from the home and working outwards into parts of society) carry with them the connotation of development as a journey, with the individual discovering routes, acquiring navigational skills, or finding helpful guides. Descriptions of the world as a stage in which we all play roles or learn our place carry

with them the implication that development involves acquiring effective ways of self-presentation or emotional management.

To take the reverse direction, descriptions of development as coming to make sense of events or to discover regularities imply a world that is not immediately comprehensible, a world in which order or structure is hidden beneath a shifting surface appearance. Descriptions of development as coming to make effective use of the symbols or artifacts available imply worlds in which various tools are available, with some probably more accessible or more promoted than others, varying over groups or across time. Descriptions as activities and changing forms of participation imply worlds that vary in the opportunities they offer for participation or for establishing routines in what one does. In effect, one way of mapping part of the person/context universe always suggests a way of mapping the other. Working from such cross-mapping is likely to be more productive than trying to link analyses that use quite separate dimensions for the description of persons and contexts (Goodnow, 2004a, 2004b, in press).

Starting from Descriptions of Contexts

There are by now many descriptions of contexts: a variety especially brought out in a review by Cooper and Denner (1998; see also Cole, Chapter 21, this *Handbook,* Volume 2).

As an opening step, we distinguish between descriptions by content and descriptions by quality. Descriptions of a culture as shared meanings and practices, or as a warehouse of narratives, for example, place their emphases on content. Descriptions of contexts as always changing, or as multiple and contested, place their emphasis on quality.

The descriptions we choose for particular comment are far from exhaustive, and the selection leaves us with a sense of regretted omissions. We would have liked, for example, to give more space to descriptions of contexts that emphasize opportunities for children and families to establish the routine, everyday activities that are seen as so crucial to development (e.g., Gallimore, Weisner, Guthrie, Bernheimer, & Nihira, 1993; Weisner, 2002). The descriptions chosen for closer comment, however, strike us as offering some particular shifts in the way we think about the shape and course of development and as containing some particular gaps.

We start with some examples of context descriptions. The first two are descriptions of cultural contexts as linked practices and warehouses of narratives. For both, and for all other descriptions, we take it for granted that cultures, like people, are always changing.

Contexts as Linked Practices. We noted in the previous edition (p. 913) that "it is always an open empirical question whether a mentality generalizes across many practice domains (the Hindu mentality) or is specific to a particular practice domain (the mentality of Hindu sleeping arrangements)." That question is prominent also in the present chapter. We are still, however, short of proposals that consider the nature of linking among practices. We noted earlier a possible linking by ways of similar dimensions being used for evaluative judgments about what is produced, using as an example Bourdieu's (1979) analysis of "taste" or "distinction" in judgments about food and about intellectual productions. A further example comes from Rogoff's (2003) analysis of the practices that go with the kinds of arrangement usually found in Western schools. Occurring together are age-grading, a concern with readiness in relation to age, the use of praise for a child's interest or achievement, the asking of questions to which answers are known, particular kinds of demands by children for adult attention, and the move of school type conversations into home settings. In another grouping, Rogoff (2003) sees an emphasis on particular kinds of relationships (horizontal or vertical, dyadic or multiparty in type) as related to differences in "sleeping arrangements, discipline, cooperation, gender roles, moral development, and forms of assistance in learning" (p. 9).

We now need further examples of such possible groups, further indications of the occurrence and the extent of linking, and a check on whether—where linked practices occur—this makes a difference to the pattern of development. The indications of linking come so far from the way adults pattern a child's social world. Do children then shift easily from one linked practice to another? Do they, for example, pick up a distinction embodied in one practice more easily when they have already experienced a linked practice rather than one that is not linked?

Contexts as Warehouses for Narratives or Interpretations. This way of viewing cultural contexts picks up the argument that all social contexts need to be seen in historical terms. In essence, the argument is that the past provides a set of texts or narratives. Each generation may then draw from the warehouse, add to it, or rediscover forgotten treasures. Each generation may also bring, to the available set, attitudes ranging from respect

to indifference, disdain, or scorn. Among cultural psychologists, Wertsch (1991) best exemplifies this approach to culture. More broadly, this concept is central to the work of Bakhtin, who noted the ways in which novelists such as Rabelais or Joyce broke the pattern of previous narratives: the one by covering topics previously regarded as not proper topics, the other by changes in structure, even at the level of sentences (Kristeva, 1980, provides a brief and readable account). In time, the argument continues, some ways of breaking up past patterns become taken up by others. They then become part of what Valsiner (1994) has described as a spiral of influence that alters the nature of what is available to draw from or is regarded as a reasonable selection:

> Novels, we would add, are not the only kinds of texts or narratives that have attracted this kind of attention and that raise questions about aspects of selection or transformation. Martin-Barbero (1993), for example, is one scholar who has brought a similar style of analysis to the way cultural expressions in the form of art, music, film, or television spread from one culture to another. It is not the case, he argues, that cultures in areas such as South America are "over-run" or "swamped" by the cultural expressions of the North. What occurs instead is a process of selection, utilization, and adaptation.

What are the implications of that kind of position for the nature of cognitive development? One is that we may now see development as including the acquisition of a stance toward the texts of the past. That stance may be one of respect and a view that the best way to approach a problem or to provide evidence for one's argument is to turn to the past. In contrast, it may be one of regarding the past as having nothing to do with the present, or as inevitably biased (the product, for example, of old people). That stance, for reasons we still need to pin down, may well change over the course of development.

Overall, warehouse accounts of contexts remind us that the central processes are likely to take the form of selection and transformation. Turning those processes into developmental form then becomes the challenge. Children's selections and transformations of narrative, an earlier section of this chapter suggests, are likely to provide an especially productive starting point. They clearly offer a base for asking about the particular narratives or narrative styles that are held out for children as the best or the ones they should take as models. We may explore also the ways in which children come to incorporate the texts they read into what they themselves produce. When a 10-year-old, for example, starts a story with the sentence—The sun rose over both worlds: the world Sven knew and the one he would be transported to—we can readily hazard a guess that the background reading includes some form of science fiction. What parts of a setting, a plot, or a collection of characters are more readily taken over or more quickly transformed than others? What makes them more likely to be treated in some ways rather than others? All told, narrative selection and transformation seems to capture especially well historical and cultural variations in what children encounter as well as processes of selection, rejection, and transformation.

Contexts as Shared Meanings or Practices. These descriptions of contexts are especially prominent in anthropology in the form of emphases on the presence of cultural models (shared ways of viewing events or people), cultural practices (shared ways of proceeding), or custom complexes (an approach that combines both actions and meanings). We have, throughout the chapter, brought out several implications of these positions for the study of development. We now add several others, prompted by a focus on cognitive development and on the quality of ideas or practices as being shared.

In some anthropological work, the quality of sharedness has given rise to questions about the degree to which there is consensus and about the position of people whose views are *modal* for the group as against being out on the edge of the variations that occur (e.g., Romney, Weller, & Batchelder, 1986). That work is with adults but suggests a new way of viewing development. In any content area and at any age, what is the degree of consensus? Are there some areas or some ages when not being part of the consensus—to be out on the margin or to disagree—is to be avoided, virtually seen as the kiss of death? What promotes an interest in coming to share the same understandings or to act in the same ways as others? The usual emphasis is on the wish to understand others and to be understood by them in ways that make easy the communication of meanings. The reasons seem likely to involve also the strategic presentation of self.

The quality of sharedness prompts other questions about what happens when there are clear departures from everyone being of one mind or acting in the one way. How do children deal with such situations? We use the example of a California classroom that served as a base for observing how children dealt with social categories (Cooper, Garcia Coll, et al., in press). In this classroom, children came from several ethnic backgrounds, signaled in some cases by skin color and in oth-

ers by the style of dress, with the most obvious dress signal being that of girls from Islamic families wearing a veil or headscarf. Teased by another child for wearing something so different, the reply by one girl was "It's part of my tradition," a reply taken from the school's orientation—conveyed in many lessons—of respecting others' traditions. The shared meaning, in effect, was used as a way of justifying an unshared practice. The selection of the reply, and its quick effect, illustrate aspects of shared meanings and practices for which other developmental examples might be sought.

Contexts as Multiple and Contested. No society is monolithic. In most industrialized societies, for example, there are usually to be found more than one religion, political party, or form of schooling, more than one class, and more than one country of origin. Some of the alternate forms may be known by adjectives that imply their minority status (e.g., alternative medicine, alternative schooling, or independent film producers). It is not only the presence of variety that matters but also the way in which these several segments compete or negotiate with one another. The people in one group, for example, may regard the people in another as best avoided, kept at arm's distance, or suppressed. Where these actions do not achieve one's purposes, some form of negotiation or takeover needs to occur. Churches may unite, union activists may be pushed into management, or independent film producers may be co-opted into studio affiliations and productions.

This way of viewing cultures is widespread in the area often known as *cultural studies* (the work cited by Martin-Barbero, 1993, is from this field). Part of its attraction for the study of development is that it leads us away from a view of culture or context as a state or thing. The emphasis falls instead on the presence of various cultural groups, on their perceptions of each other, and on their relationships with each other. In addition, recognition of the extent to which encounters with other people or other positions are usually controlled is prompted.

Control over access to knowledge is a long-standing theme in sociological analyses (e.g., Bourdieu & Passeron, 1977; Foucault, 1980). In developmental studies, it is represented by studies comparing the understanding of animal biology that develops when children can vary their approaches to feeding and care against being restricted to the teachers' prescriptive routines (Hatano & Inagaki, 1986). In a more social fashion, it is represented by questions about the nature of children's encounters with other people. Parents may act in cocoon fashion, structuring a child's world so that experience with different others is at least delayed (Goodnow, 1997), or they may engage in more direct preparatory work. When a child is seen as likely to encounter discrimination, for example, parents may encourage pride in the group's own history, or teach specific ways of responding to name-calling or other derogatory actions (Hughes & Chen, 1999). Both kinds of experience should affect the social categories, the stances toward others, and the degree of reflectiveness about differences among people that children develop. We have a great deal yet to learn about the nature of such effects. They are likely to provide, however, some sharp examples of how particular qualities of social/cultural contexts are related to some particular qualities of cognitive development.

Starting from Descriptions of Cognitive Development

In the previous section, we started from descriptions of cultural contexts and asked about links to descriptions of cognitive development, noting any suggested new ways of considering development or new research questions. In a change of method, we now reverse directions. We start from some particular descriptions of cognitive development and ask how cultural contexts enter the picture.

There are many ways of describing cognitive development. In the previous edition, we noted three: (1) a shift from an initially weak or fluid state to one that was better established or more smooth in its execution; (2) a change in the nature of information processing: changes, for example, in what is attended to or rehearsed; and (3) a move toward dividing cognitive development into domains, with proposals for differences in the nature of development by domain.

The third direction is the one to which we gave most attention then and now. The focus reflects the extent to which debates about domain specificity have been prime sites for exploring questions highlighted at the start of this chapter such as whether, in the area of cognitive development, there is a place for social or cultural factors (innate predispositions might offer a sufficient account of development), what that place might be, and how given abilities and cultural circumstances might be brought together.

In essence, the synthesis regards two kinds of domains as varying considerably in the way cognitive development proceeds. A distinction is drawn between core or privileged domains and other domains (Keil, 1984; Siegler & Crowley, 1994; Wellman & Gelman,

1998). First, in privileged domains, humans are genetically prepared to acquire knowledge systems that deal with important aspects of the world. Second, in nonprivileged domains, development relies on general learning mechanisms (Keil, 1984) or module acquisition modules (Sperber, 2002). In these domains, cognitive development is usually conceptualized as the gaining of expertise. In both domains, sociocultural perspectives have something to offer. Because the two kinds of domain have been conceptualized differently, suggestions from cultural psychology vary from one to the other.

Nonprivileged Domains: Cognitive Development as Expertise. Traditionally, expertise means the accumulation of rich and well-structured domain knowledge, consisting of "chunks" that can readily be used (Chi, Glaser, & Farr, 1988). There is also wide agreement among cognitive researchers that gaining expertise requires years of experience in solving problems in the domain, carried out with concentration and often taking the form of deliberate practice (Ericsson, 1996).

What does cultural psychology add to these characterizations? A central addition, as we see it, is the elaboration of what *expertise* consists of and how it is acquired.

We begin with the argument that through repeated participation in culturally organized practices, both children and lay adults acquire the skills and knowledge needed to perform competently in those practices (Goodnow et al., 1995). To this we add, first, what matters is not only the amount of time spent in repetition but also the nature of what is repeated. Studies by Oura and Hatano (2001) with a group of nonprofessional pianists bring out this point especially. All of these pianists had started piano lessons at 6 years of age or younger. Some, however, had reached a junior expert level. Others were still at a more novice level. Oura and Hatano (2001) asked both to practice a short piece of music. Those who had stayed at the novice level tried only to perform accurately and smoothly. Those who had reached the junior expert level checked and refined their performance from the perspective of an audience in mind. In effect, the two differed in the practice in which they had engaged. The less successful students had expected to play for the teacher who would evaluate how smoothly and how accurately they played. In contrast, the successful students had practiced for playing in public, with an eye to ways of creating their own expression.

Second, we add that the process of gaining expertise is assisted by other people and artifacts: Novices are not expected to solve problems all by themselves. A study by Takahashi and Tokoro (2002) of experienced amateur photographers (senior shutterbugs) brings out this point. Most senior shutterbugs explicitly expressed their appreciation of their supporting networks: networks involving peers, the instructor, and family members who provided transport, prepared lunchboxes, and so on. Even when learners' problem solving activities were apparently solo, other people entered the picture in the form of possible competitors or possible buyers of what one produced. The senior shutterbugs, for example, wanted to take at each moment shots that they and others would regard as good. Their skills improved, unlike school learning, almost as a by-product of keeping these audiences in mind.

A third addition, again broadening our understanding of what is acquired in the course of gaining expertise, emphasizes that the acquisition of knowledge and skills is accompanied by socioemotional changes—for example, changes in interest, values, and identity. That position has been stated with particular strength in Lave's (1991) argument that the practices that developing individuals engage in are embedded in a community of practitioners. All practices, it has come to be recognized, involve socioemotional interactions as well as cognitive divisions of labor. The process of gaining expertise is not likely to be an exception. It cannot be purely cognitive. In one example, Japanese students who develop expertise in the use of the abacus do so in a national climate of admired expertise and in the company of others who are also members of abacus clubs or competitive teams (Hatano, 1995). To take another, volunteers serving at a soup kitchen for homeless people became not only skilful at helping them but also, more important, more favorable toward and sympathetic to those people (Youniss & Yates, 1997).

Finally, cultural perspectives help us as well to distinguish among domains in terms of the kind of expertise required and the occurrence of innovation. Some domains of expertise are knowledge lean: Expertise in these domains is reproductive in nature. Other domains are knowledge rich: In these, individuals, after gaining expertise, are most likely to contribute to cultural change. Expert cooks, for example, may invent new dishes by combining a variety of materials and modes of cooking. The invented dishes may then be incorporated into the culture of cooking, if the new productions attract a number of members constituting the community of cooks.

Conceptual Development in Core or Privileged Domains. In these domains, cognitive development is conceptualized quite differently from what happens in nonprivileged domains. The accounts start from the argument that human beings are biologically predisposed, prior to any experience, to attend to some events rather than others and to make some inferences rather than others (e.g., Keil, 1984). Coherent bodies of knowledge about important aspects of the world are then built on these bases, with many researchers assuming that the acquisition of core domains of thought such as naive physics, psychology, and biology is early, easy, and almost universal. The ways in which this construction takes place may be varied. As Karmiloff-Smith (1992) notes, the innate constraints may "potentiate learning by limiting the hypotheses entertained" (p. 11), but they may also place limits on what is readily learnable. One early assumption was that the evidence for predispositions tended to minimize the role of culture in earlier conceptual development, especially in the first few years (e.g., Carey & Spelke, 1994).

How do cultural psychologists challenge views that exclusively emphasize human inheritance from evolution? The domain of naive psychology or theory of mind (TOM) provides a nice illustration, bringing out how cultural-psychological views change the characterization of the course of development as well as the research methodology.

In a large-scale meta-analysis of studies by Wellman, Cross, and Watson (2001), for example, many studies emerged as focused on identifying age-dependent developmental patterns. The overall pattern of results is that younger children fail to, but children a few years older correctly, recognize that people act in accordance with what they believe is the case, whether it corresponds with the reality that the child has come to know. The overall assumption is that experience makes little difference in this sequence.

An increasing number of innovative studies are compatible with, if not influenced by, cultural-psychological views. Some of these studies assume that attention to forms of communication with significant others may yield different perspectives on the development of TOM. Some, as we noted earlier, assign particularly important roles in TOM development to the use of language as a tool representing mental states (Astington & Baird, in press).

In terms of research methods, these studies aim to connect children's sociocultural experiences to their developing understanding of mental states of themselves and others. One such method is to analyze children's everyday conversation in families prior to a check on their understanding of beliefs as determinants of behavior. For example, family differences in explanatory conversations have been found to be associated with children's later development of TOM (e.g., Dunn, Brown, Slomkowski, Tesla, & Youngblade, 1991; Dunn, 2000). Another research strategy is to compare the TOM performances of different populations of children. Convincing evidence for the importance of complex communication with significant others for the TOM development, for example, is given by Peterson and Siegal (1995): Deaf children's development of TOM is delayed when their parents are hearing individuals who had to learn a sign language later in their life but is *not* delayed when the parents are fluent signers. Still another method that can show the causal effect of linguistic interaction in the TOM development consists of training studies. Lohmann and Tomasello (2003), for example, have demonstrated that 3-year-olds' false belief understanding is facilitated both by perspective-shifting discourse and by sentential complement syntax that represents a belief decoupled from reality.

The domain of naive biology also contains both mainstream conventional studies of age-dependent development and innovative sociocultural studies. For example, among the studies reviewed by Inagaki and Hatano (2002), the majority started from a traditional view of development and focused on the ages at which children would acquire "autonomous" biology. A small number of studies, however (harmonious with cultural-psychological views) showed that the age-dependent developmental patterns observed among urban children (typical experimental participants) are not universal. Instead, the pattern varies with particular kinds of experience.

Most studies have shown that young children's naive biology is human-centered: The properties attributed to other animals tend to be generalized from what is known to be the case for humans. This tendency is weaker or nonexistent, however, among children who have had frequent direct contact with nonhuman animals and plants (Atran et al., 2001; Ross et al., 2003). Even among urban children, active and enduring involvement in animal-raising activity mitigates the human-centered nature of biology. Their enriched knowledge about animals they have raised serves as an extra source for the analogical understanding of animals not yet experienced (Inagaki,

1990). Children's understanding can also be influenced by cultural ideas about the categories in which humans, other animals, and plants can be placed (Hatano et al., 1993; Stavy & Wax, 1989). In short, even young children's naive biology is instantiated differently in different sociocultural environments.

Moving beyond specific areas of knowledge are several proposals for the need to take an interactive view of genetic predispositions and sociocultural facilitations or constraints. Gelman (1990), for example, proposes that innate constraints are so skeletal that they always have to be complemented socioculturally. Another possibility is that both types of constraints usually operate in a mutually facilitating or bootstrapping way, with innate constraints becoming less important as rich domain knowledge is acquired through cultural learning. Worth particular note is the argument that, in a few years after birth, children begin to learn in a uniquely human way, exemplified by joint attention and imitation (Tomasello et al., 1993).

Those several proposals go beyond a view of development as shaped only by genetic predispositions or by sociocultural circumstances. People undoubtedly come equipped to make some distinctions—between inside and outside or animate and inanimate objects. Cultures, however, provide usable artifacts that are shared by a majority of people in a community or a subgroup. These artifacts include physical facilities and tools, social institutions and organizations, documented pieces of knowledge, and commonsense beliefs. They also include the behavior of other people, interactions with them, and social contexts created by them. Cognitive development is best seen as interactively constrained by both sociocultural circumstances as well as genetic predispositions (Hatano & Inagaki, 2000).

A Summary Comment on Cognitive Development: Methods

The account just concluded—covering several ways in which people have explored the place of sociocultural experience in cognitive domains often proposed as the province of genetic predispositions—has brought to the surface a variety of methods. Variety in method provides a way of bringing this section on cognitive development to a close and of underlining again some points about method that have been made in earlier sections of the chapter: in particular, the place of shifts in method as one of the prime features of a cultural psychology perspective.

Making comparisons across cultures, although often informative, is not the only method possible. The most informative route may be a concentration on a culture and on some local practices or ways of thinking. Also valuable is working from a local practice and asking what ideas accompany it or, conversely, starting with a stated or inferred belief and asking what practices might be associated with it.

That aspect of methods (across or in cultures) is not only a pragmatic issue. It reflects also, as Cole (2001) has pointed out, the recognition that "all human groups inhabit a world suffused with their predecessors' history . . . culture and cultural mediation are universal features of human life and an integral part of human development. Consequently, the process of cultural mediation can be studied in a broad range of practices within any large, demographic, culturally constituted group" (p. 168).

We hope it has been evident that we see great benefit in borrowing freely from both experimental and ethnographic approaches, with psychologists perhaps benefiting from a fuller knowledge of how a variety of ethnographic methods may be used (P. J. Miller et. al., 2003, is a useful source). Borrowing conceptual analyses from outside psychology is also important. We have drawn on occasion from anthropology, sociology, and—less frequently than we might do—areas often known as cultural or narrative studies. We have regrettably made the least use of history, a deficit that Cole (2001) points out as applying to many psychological analyses of the cultural nature of human development. The historical analysis of how mind, body, and soul or heart have at various times been separated or merged with one another would in itself, for example, round out our steps in this chapter toward moving beyond current dichotomies.

Our hope is that the benefits of cultural psychology for the analysis of cognitive development lie not only in its prompting fresh approaches to questions about what develops and how this takes place but also in enriching the repertoire of methods that we bring to those questions.

CONCLUSION

It is the hope of all those who welcome the return of cultural psychology as a vibrant research enterprise that more and more social scientists from various home disciplines (psychology, anthropology, linguistics, sociology) will become developmental experts on

the psychological functioning of members of particular cultural communities around the world. Only then will the many questions raised in this chapter begin to be answered. Only then will the abstract pluralistic idea of "one mind, many mentalities" become substantial and concrete, and thereby come fully to life. It is when another culture's taken-for-granted categories appear to us to be counter-intuitive, or out of line with what we assume to be present early in life, that we are most likely to experience the need to rethink our sense of what is natural.

REFERENCES

Abbott, S. (1992). Holding on and pushing away: Comparative perspectives on an eastern Kentucky child-rearing practice. *Ethos, 1,* 33–65.

Ainsworth, M. D. S. (1967). *Infancy in Uganda.* Baltimore: Johns Hopkins University Press.

Ainsworth, M. D. S., Blehar, M. C., Waters, E., & Wall, S. (1978). *Patterns of attachment: A Psychological Study of the Strange Situation.* Hillsdale, NJ: Erlbaum.

Alexander, K. J., Miller, P. J., & Hengst, J. A. (2001). Young children's emotional attachments to stories. *Social Development, 10*(3), 374–398.

Allport, G. W. (1937). *Personality: A psychological interpretation.* New York: Holt.

Ames, R. T., Dissanayake, W., & Kasulis, T. P. (1994). *Self as person in Asian theory and practice.* Albany: State University of New York Press.

Astington, J. W., & Baird, J. (Eds.) (in press). *Why language matters for theory of mind.* New York: Oxford University Press.

Atran, S., Medin, D., Lynch, E., Vapnarsky, V., Ek, E. U., & Sousa, P. (2001). Folkbiology doesn't come from folkpsychology: Evidence from Yukatek Maya in cross-cultural perspective. *Journal of Cognition and Culture, 1,* 3–43.

Azuma, H., Kashiwagi, K., & Hess, R. D. (1981). *The influence of attitude and behavior upon the child's intellectual development.* Tokyo: University of Tokyo Press.

Bachnik, J. M. (1994). Uchi/soto—Challenging our conceptualizations of self, social order, and language. In J. M. Bachnik & C. J. Quinn Jr. (Eds.), *Situated meaning: Inside and outside in Japanese self, society, and language* (pp. 3–37). Princeton, NJ: Princeton University Press.

Bakhtin, M. M. (1981). *The dialogic imagination.* Austin: University of Texas Press.

Bakhtin, M. M. (1986). *Speech genres and other late essays.* Austin: University of Texas Press.

Baldwin, J. M. (1911). *The individual and society.* Boston: Boston Press.

Baldwin, M. W., & Holmes, J. G. (1987). Salient private audiences and awareness of the self. *Journal of Personality and Social Psychology, 52,* 1087–1098.

Banaji, M., & Prentice, D. (1994). The self in social contexts. *Annual Review of Psychology, 45,* 297–332.

Banarjee, R. (2002). Audience effects of self-presentation in childhood. *Social Development, 11,* 487–507.

Basso, K. (1996). *Wisdom sits in places: Landscape and language among the Western Apache.* Albuquerque: University of New Mexico Press.

Bauman, R., & Briggs, C. L. (1990). Poetics and performance as critical perspectives on language and social life. *Annual Review of Anthropology, 19,* 59–88.

Bauman, R., & Sherzer, J. (Eds.). (1989). *Explorations in the ethnography of speaking* (2nd ed.). New York: Cambridge University Press.

Baumeister, R. F. (1987). How the self became a problem: A psychological review of historical research. *Journal of Personality and Social Psychology, 52,* 163–176.

Bayley, R., & Schecter, S. R. (Eds.). (2003). *Language socialization in bilingual and multilingual societies.* Tonawanda, NY: Multilingual Matters Ltd.

Bellah, R. N., Madsen, R., Sullivan, W. M., Swidler, A., & Tipton, S. M. (1985). *Habits of the heart: Individualism and commitment in American life.* New York: Harper & Row.

Benedict, R. (1934). *Patterns of culture.* New York: Houghton Mifflin.

Benson, C. (2001). *The cultural psychology of self: Place, morality and art in human worlds.* New York: Routledge.

Berlin, I. (1976). *Vico and Herder.* London: Hogarth Press.

Berman, R., & Slobin, D. (1994). *Relating events in narrative: A crosslinguistic developmental study.* Hillsdale: NJ: Erlbaum.

Berry, J. W., Poortinga, Y. H., Segall, M. H., & Dasen, P. R. (1992). *Cross-cultural psychology: Research and applications.* Cambridge, England: Cambridge University Press.

Bledsoe, C. (1989). Strategies of child-fosterage among Mende grannies in Sierra Leone. In R. J. Lesthaeghe (Ed.), *Reproduction and social organization in sub-Saharan Africa.* Berkeley: University of California Press.

Bledsoe, C. (1990). No success without struggle: Social mobility and hardship for foster children in Sierra Leone. *Man, 25,* 70–88.

Blumenfeld, P., Modell, J., Bartko, T., Secada, W., Fredricks, J., Friedel, J., et al. (in press). School engagement of inner city students during middle childhood. In C. R. Cooper, C. García Coll, T. Bartko, H. Davis, & C. Chapman (Eds.), *Hills of gold: Rethinking diversity and contexts as resources for children's developmental pathways.* New York: Oxford University Press.

Boesch, E. E. (1991). *Symbolic action theory and cultural psychology.* New York: Springer-Verlag.

Bond, M. H., & Cheung, T. S. (1983). College students' spontaneous self-concept: The effect of culture among respondents in Hong Kong, Japan, and the United States. *Journal of Cross-Cultural Psychology, 14,* 153–171.

Bornstein, M. H., Azuma, H., Tamis-LeMonda, C. S., & Ogino, M. (1990). Mother and infant activity and interaction in Japan and in the United States: I. A comparative macroanalysis of naturalistic exchanges. *International Journal of Behavioral Development, 13*(3), 267–287.

Bornstein, M. H., & Cote, L. R. (2004). Mothers' parenting cognitions in cultures of origin, acculturating cultures, and cultures of destination. *Child Development, 75*(1), 221–235.

Bourdieu, P. (1972). *Outline of a theory of practice.* Cambridge, England: Cambridge University Press.

Bourdieu, P. (1979). *Distinction: A social critique of the judgment of taste.* London: Routledge & Kegan Paul.

Bourdieu, P. (1990). *A logic of practice.* Stanford, CA: Stanford University Press.

Bourdieu, P. (1991). *Language and symbolic power.* Cambridge, MA: Harvard University Press.

Bourdieu, P., & Passeron, J.-C. (1977). *Reproduction in education, society and culture.* Beverly Hills: Sage.

Bracken, B. A. (1996). Clinical applications of a context-dependent, multidimensional model of self-concept. In B. Bracken (Ed.), *Handbook of self concept.* New York: Wiley.

Brazelton, T. B. (1990). Parent-infant co-sleeping revisited. *Ab Initio: An International Newsletter for Professionals Working with Infants and Their Families, 1,* 1–7.

Briggs, C. L. (1986). *Learning how to ask: A sociolinguistic appraisal of the role of the interview in social science research.* New York: Cambridge University Press.

Briggs, J. L. (1992). Mazes of meaning: How a child and a culture create each other. In W. A. Corsaro & P. J. Miller (Eds.), *Interpretive approaches to child socialization* (pp. 25–50). San Francisco: Jossey-Bass.

Briggs, J. L. (1998). *Inuit morality play: The emotional education of a three-year-old.* New Haven, CT: Yale University Press.

Bronfenbrenner, U. (1979). *The ecology of human development.* Cambridge, MA: Harvard University Press.

Bronfenbrenner, U., Kessel, F., Kessen, W., & White, S. (1985). Toward a critical social history of developmental psychology. *American Psychologist, 41,* 1218–1230.

Bruner, J. S. (1986). *Actual minds, possible worlds.* Cambridge, MA: Harvard University Press.

Bruner, J. S. (1990a). *Acts of meaning.* Cambridge, MA: Harvard University Press.

Bruner, J. S. (1990b). Culture and human development: A new look. *Human Development, 33,* 344–355.

Bruner, J. S. (1993). Do we "acquire" culture or vice versa: Reply to M. Tomasello, A. C. Kruger, & H. H. Ratner, Cultural learning. *Behavioral and Brain Sciences, 163*(3), 515–516.

Bullock, M., & Lütkenhaus, P. (1990). Who am I? Self-understanding in toddlers. *Merrill-Palmer Quarterly, 36*(2), 217–238.

Burger, L. K., & Miller, P. J. (1999). Early talk about the past revisited: A comparison of working-class and middle-class families. *Journal of Child Language, 26,* 1–30.

Cahan, E. D., & White, S. H. (1992). Proposals for a second psychology. *American Psychologist, 47,* 224–235.

Camic, C. (1986). The matter of habit. *American Journal of Sociology, 91,* 1039–1087.

Carey, S., & Spelke, E. (1994). Domain-specific knowledge and conceptual change. In L. A. Hirschfeld & S. Gelman (Eds.), *Mapping the mind: Domain specificity in cognition and culture* (pp. 169–200). Hillsdale, NJ: Erlbaum.

Carrithers, M., Collins, S., & Lukes, S. (1987). *The category of the person: Anthropology, philosophy, history.* Cambridge, England: Cambridge University Press.

Carroll, V. (Ed.). (1970). *Adoption in Eastern Oceania.* Honolulu: University of Hawaii Press.

Caudill, W., & Plath, D. W. (1966). "Who sleeps by whom? Parent-child involvement in urban Japanese Families." *Psychiatry, 29,* 344–366.

Caudill, W., & Schooler, C. (1973). Child behavior and child rearing in Japan and the United States: An interim report. *Journal of Nervous and Mental Diseases, 157,* 323–338.

Caudill, W., & Weinstein, H. (1969). Maternal care and infant behavior in Japan and America. *Psychiatry, 32,* 12–43.

Caudill, W., & Weinstein, H. (1986). Maternal care and infant behavior in Japan and America. In T. S. Lebra & W. P. Lebra (Eds.), *Japanese culture and behavior: Selected readings* (pp. 201–246). Honolulu: University of Hawaii Press.

Cazden, C. B. (1993). Vygotsky, Hymes, and Bakhtin: From word to utterance and voice. In E. A. Forman, N. Minick, & C. A. Stone (Eds.), *Contexts for learning: Sociocultural dynamics in children's development* (pp. 197–212). New York: Oxford University Press.

Cervantes, C. A. (2002). Explanatory emotion talk in Mexican-immigrant and Mexican-American families. *Hispanic Journal of Behavioral Sciences, 24,* 139–164.

Chao, R. K. (1992). Immigrant Chinese mothers and European American mothers: Their aims of control and other child-rearing aspects related to school achievement. *Dissertation Abstracts International, 53*(6-A), 1787–1788.

Chao, R. K. (1993a). *Clarification of the authoritarian parenting style and parental control: Cultural concepts of Chinese child rearing.* Paper presented at the meeting of the Society for Research in Child Development, New Orleans, LA.

Chao, R. K. (1993b). *East and West concepts of the self reflecting in mothers' reports of their child rearing.* Los Angeles: University of California.

Chi, M. T. H., Glaser, R., & Farr, M. J. (Eds.). (1988). *The nature of expertise.* Hillsdale, NJ: Erlbaum.

Clancy, P. (1999). The socialization of affect in Japanese mother-child conversation. *Journal of Pragmatics, 31*(4), 1397–1421.

Clark, C. D. (2003). *In sickness and in play: Children coping with chronic illness.* New Brunswick, NJ: Rutgers University Press.

Clark, H. (1996). *Language in use.* New York: Cambridge University Press.

Cole, M. (1988). Cross-cultural research in the sociohistorical tradition. *Human Development, 31,* 137–157.

Cole, M. (1990). Cultural psychology: A once and future discipline. In J. J. Berman (Ed.), *Nebraska Symposium on Motivation: Vol. 37. Cross-cultural perspectives.* Lincoln: University of Nebraska Press.

Cole, M. (1992). Context, maturity, and the cultural constitution of development. In L. T. Winegar & J. Valsiner (Eds.), *Children's development within social context: Vol. 2. Research and methodology* (pp. 5–31). Hillsdale, NJ: Erlbaum.

Cole, M. (1995). The supra-individual envelope of development: Activity and practice, situation and context. In J. J. Goodnow, P. J. Miller, & F. Kessel (Eds.), *Cultural practices as contexts for development: New directions for child development.* San Francisco: Jossey-Bass.

Cole, M. (1996). *Cultural psychology: A once and future discipline.* Cambridge, MA: Harvard University Press.

Cole, M. (1999). Culture in development. In M. H. Bornstein & M. E. Lamb (Eds.), *Developmental psychology: An advanced textbook* (4th ed., pp. 73–123). Mahwah, NJ: Erlbaum.

Cole, M. (2001). Remembering history in sociocultural research. *Human Development, 44,* 166–169.

Cole, M., Engeström, Y., & Velasquéz, O. (2000). *Mind, culture, and activity.* New York: Cambridge University Press.

Cole, M., & Traupmann, K. (1981). Comparative cognitive research: Learning from learning disabled children. In W. A. Collins (Ed.), *Minnesota Symposia on Child Psychology: Vol. 14. Aspects of the development of competence* (pp. 125–155). Hillsdale, NJ: Erlbaum.

Coles, R. (1989). *The call of stories.* Boston: Houghton Mifflin Company.

Collingwood, R. G. (1961). On the so-called idea of causation. In H. Morris (Ed.), *Freedom and responsibility: Readings in philosophy and law.* Stanford, CA: Stanford University Press.

Cooley, D. H. (1902). *Human nature and the social order.* New York: Scribners.

Cooper, C. R., & Denner, J. (1998). Theories linking culture and psychology: Universal and community-specific processes. *Annual Review of Psychology, 49,* 559–584.

Cooper, C. R., Dominguez, E., & Rosas, S. (in press). Soledad's dream: Immigration, children's worlds, and immigration pathways to college. In C. R. Cooper, C. García Coll, T. Bartko, H. Davis, & C. Chapman (Eds.), *Hills of gold: Rethinking diversity and contexts as resources for children's developmental pathways.* New York: Oxford University Press.

Cooper, C. R., García Coll, C., Thorne, B., & Orellana, M. F. (in press). Beyond social categories: Studying four social processes in immigration, ethnicity, and race in children's lives at school. In C. R. Cooper, C. García Coll, T. Bartko, H. Davis, & C. Chapman (Eds.), *Hills of gold: Rethinking diversity and contexts as resources for children's developmental pathways.* New York: Oxford University Press.

Coopersmith, S. A. (1967). *The antecedents of self-esteem.* San Francisco: Freeman.

Corsaro, W. A. (1992). Interpretive reproduction in children's peer culture. *Social Psychology Quarterly, 55,* 160–177.

Corsaro, W. A. (1997). *The sociology of childhood.* Thousand Oaks, CA: Pine Forge Press.

Corsaro, W. A., & Miller, P. J. (Eds.). (1992). *Interpretive approaches to childhood socialization—New directions for child development: Vol. 58.* San Francisco: Jossey-Bass.

Corsaro, W. A., Molinari, L., & Rosier, K. A. (2002). Zena and Carlotta: Transition narratives and early education in the United States and Italy. *Human Development, 45,* 323–348.

Cortés, D. E. (1995). Variations in familism in two generations of Puerto Ricans. *Hispanic Journal of Behavioral Sciences, 17,* 249–255.

Cousins, S. D. (1989). Culture and self-perception in Japan and the United States. *Journal of Personality and Social Psychology, 56,* 124–131.

Crocker, J., Major, B., & Steele, C. (1998). Social stigma. In D. Gilbert, S. Fiske, & L. Gardner (Eds.), *The handbook of social psychology* (Vol. 2, 4th ed., pp. 504–553). New York: McGraw-Hill.

Crook, C. (2003). The cultural nature of human development. *British Journal of Developmental Psychology, 21*(4), 618–619.

Cushman, P. (1995). *Constructing the self, constructing America: A cultural history of psychotherapy.* Boston: Addison-Wesley.

Damon, W. (1984). Peer interaction: The untapped potential. *Journal of Applied Developmental Psychology, 5,* 331–343.

Damon, W. (1995). *Greater expectations: Overcoming the culture of indulgence in America's homes and schools.* New York: Free Press.

Damon, W., & Hart, D. (1988). *Self understanding in childhood and adolescence.* New York: Cambridge University Press.

D'Andrade, R. G. (1981). The cultural part of cognition. *Cognitive Science, 5,* 179–195.

D'Andrade, R. G. (1992). Schemas and motivations. In R. G. D'Andrade & C. Strauss (Eds.), *Human motives and cultural models* (pp. 23–44). New York: Cambridge University Press.

D'Andrade, R. G. (1995). *The development of cognitive anthropology.* Cambridge, England: Cambridge University Press.

Deci, E. L., & Ryan, R. M. (1990). A motivational approach to self: Integration in personality. In R. A. Dienstbier (Ed.), *Nebraska Symposium on Motivation: Vol. 38. Perspectives on motivation* (pp. 237–288). Lincoln: University of Nebraska Press.

de León, L. (2000). The emergent participant: Interactive patterns in the socialization of Tzotzil (Mayan) infants. *Journal of Linguistic Anthropology, 8*(2), 131–161.

Deng, F. M. (1972). *The Dinka of the Southern Sudan.* New York: Holt, Rinehart and Winston.

Dewey, J. (1938). *Experience and education.* New York: Macmillan.

Doi, T. (1981). *The anatomy of dependence.* Tokyo: Kodansha.

Donagan, A. (1987). *Choice, the essential element in human action.* London: Routledge & Kegan Paul.

Dunn, J. (1983). Sibling relationships in early childhood. *Child Development, 54,* 787–811.

Dunn, J. (1993). *Young children's close relationships: Beyond attachment.* Newbury Park, CA: Sage.

Dunn, J. (2000). Mind-reading, emotion understanding, and relationships. *International Journal of Behavioral Development, 24,* 142–144.

Dunn, J., Brown, J., Slomkowski, C., Tesla, C., & Youngblade, L. (1991). Young children's understanding of other people's feelings and beliefs: Individual differences and their antecedents. *Child Development, 62,* 1352–1366.

Duranti, A., & Goodwin, C. (1992). *Rethinking context: Language as an interactive phenomenon.* New York: Cambridge University Press.

Dyson, A. H. (1993). *Social worlds of children learning to write in an urban primary school.* New York: Teachers College Press.

Dyson, A. H., & Genishi, C. (Eds.). (1994). *The need for story: Cultural diversity in classroom and community.* Urbana, IL: National Council of Teachers of English.

Eckensberger, L. H. (1990). From cross-cultural psychology to cultural psychology. *Quarterly Newsletter of the Laboratory of Human Cognition, 12,* 37–52.

Eckensberger, L. H. (1995). Activity or action: Two different roads towards an integration of culture into psychology. *Culture and Psychology, 1,* 67–80.

Eder, R. A., & Mangelsdorf, S. (1997). The emotional basis of early personality development: Implications for the emergent self-concept. In R. Hogan, J. Johnson, & S. Briggs (Eds.), *Handbook of personality psychology.* Orlando, FL: Academic Press.

Eisenberg, A. R. (1985). Learning to describe past experiences in conversation. *Discourse Processes, 8,* 177–204.

Eisenberg, A. R. (1986). Teasing: Verbal play in two Mexicano homes. In B. B. Schieffelin & E. Ochs (Eds.), *Language socialization across cultures* (pp. 182–198). New York: Cambridge University Press.

Elster, J. (1987). *The multiple self.* Cambridge, England: Cambridge University Press.

Engel, S. (1995). *The stories children tell: Making sense of the narratives of childhood.* New York: Freeman.

Epstein, S. (1973). The self-concept revisited or a theory of a theory. *American Psychologist, 28,* 405–416.

Erickson, F. D. (1986). Qualitative methods in research on teaching. In M. C. Wittrock (Ed.), *Handbook of research on teaching* (3rd ed.). New York: Macmillan.

Ericsson, K. A. (Ed.). (1996). *The road to excellence.* Mahwah, NJ: Erlbaum.

Erikson, E. (1968). *Identity: Youth and crisis.* New York: Norton.

Fader, A. (2001). Literacy, bilingualism and gender in a Hasidic community. *Linguistics and Education, 12*(3), 261–283.

Fajans, J. (1985). The person in social context: The social character of Baining "psychology." In G. M. White & W. J. Kirkpatrick (Eds.), *Person, self, and experience* (pp. 367–400). Berkeley: University of California Press.

Farver, J. M. (1999). Activity setting analysis: A model for examining the role of culture in development. In A. Göncü (Ed.), *Children's engagement in the world* (pp. 99–127). New York: Cambridge University Press.

Farver, J. M., Kim, Y. K., & Lee, Y. (1995). Cultural differences in Korean- and Anglo-American preschoolers' social interaction and play behaviors. *Child Development, 66*(4), 1088–1099.

Fernald, A., & Morikawa, H. (1993). Common themes and cultural variations in Japanese and American mothers' speech to infants. *Child Development, 64*(3), 637–656.

Fiske, A., Kitayama, S., Markus, H. R., & Nisbett, R. E. (1998). The cultural matrix of social psychology. In D. Gilbert, S. Fiske, & G. Lindzey (Eds.), *The handbook of social psychology* (pp. 915–981). San Francisco: McGraw-Hill.

Fiske, A. P. (1991). *Structures of social life: The four elementary forms of human relations.* New York: Free Press.

Fiske, A. P. (1992). The four elementary forms of sociality: Framework for a unified theory of social relations. *Psychological Review, 99,* 689–723.

Fiske, A. P., & Tetlock, P. E. (1997). Taboo trade-offs: Reactions to transgressions that transgress spheres of exchange. *Political Psychology, 18,* 255–297.

Fivush, R. (1993). Emotional content of parent-child conversations about the past. In C. A. Nelson (Ed.), *Minnesota Symposia on Child Psychology: Vol. 26. Memory and affect in development* (pp. 39–77). Hillsdale, NJ: Erlbaum.

Fivush, R., & Buckner, J. P. (2000). Gender, sadness, and depression: The development of emotional focus through gendered discourse. In A. H. Fischer (Ed.), *Gender and emotion: Social psychological perspectives* (pp. 232–253). New York: Cambridge University Press.

Flanagan, O. (1992). *Consciousness reconsidered.* Cambridge, MA: MIT Press.

Flavell, J. H., Green, F. L., & Flavell, E. R. (1995). Young children's knowledge about thinking. *Monographs of the Society for Research in Child Development, 60*(1, Serial No. 243).

Foucault, M. (1980). *Power-knowledge: Selected interviews and other writings.* Brighton, Great Britain: Harvester Press.

Frijda, N. H., & Mesquita, B. (1994). The social roles and functions of emotions. In S. Kitayama & H. R. Markus (Eds.), *Emotion and culture* (pp. 51–87). Washington, DC: American Psychological Association.

Fuligni, A. (2001). Family obligation and academic motivation of adolescents from Asian, Latin American, and European backgrounds. In A. J. Fuligni (Ed.), *Family obligation and assistance during adolescence: Contextual variations and developmental implications* (pp. 61–76). San Francisco: Jossey-Bass.

Fung, H. (1999). Becoming a moral child: The socialization of shame among young Chinese children. *Ethos, 27,* 180–209.

Fung, H. (2003). When culture meets psyche: Understanding the contextualized self through the life and dreams of an elderly Taiwanese woman. *Taiwan Journal of Anthropology, 1*(2), 149–175.

Fung, H., & Chen, E. C. (2001). Across time and beyond skin: Self and transgression in the everyday socialization of shame among Taiwanese preschool children. *Social Development, 10,* 419–436.

Fung, H., Miller, P. J., & Lin, L. (2004). Listening is active: Lessons from the Narrative Practices of Taiwanese Families. In M. W. Pratt & B. H. Fiese (Eds.), *Family stories and the life course* (pp. 303–323). Mahwah, NJ: Erlbaum.

Gallimore, R., Weisner, T., Guthrie, D., Bernheimer, L. P., & Nihira, K. (1993). Family responses to young children with developmental delays: Accommodation activity in ecological and cultural context. *American Journal of Mental Retardation, 98,* 185–206.

Garrett, P. B., & Baquedano-López, P. (2002). Language socialization: Reproduction and continuity, transformation and change. *Annual Review of Anthrolopology, 31,* 339–361.

Garvey, C. (Ed.). (1992). Introduction: Talk in the study of socialization and development [Invitational issue]. *Merrill-Palmer Quarterly, 38*(1), iii–viii.

Garvey, C., & Kramer, T. (1989). The language of social pretend play. *Developmental Review, 9,* 364–382.

Gaskins, S. (1999). Children's daily lives in a Mayan village: A Case Study of Culturally Constructed Roles and Activities. In A. Göncü (Ed.), *Children's engagement in the world* (pp. 25–61). New York: Cambridge University Press.

Gauvain, M. (2001). Cultural tools, social interaction, and the development of thinking. *Human Development, 44,* 126–143.

Geertz, C. (1973a). The impact of the concept of culture on the concept of man. In C. Geertz (Ed.), *The interpretation of cultures.* New York: Basic Books.

Geertz, C. (Ed.). (1973b). *The interpretation of cultures.* New York: Basic Books.

Geertz, C. (1984). From the natives' point of view. In R. A. Shweder & R. A. LeVine (Eds.), *Culture theory: Essays on mind, self and emotion.* New York: Cambridge University Press.

Gelman, R. (1990). First principles organize attention to and learning about relevant data: Numbers and the animate-inanimate distinction as examples. *Cognitive Science, 14,* 79–106.

Gergen, K. J. (1968). Personal consistency and the presentation of self. In C. Gordon & K. J. Gergen (Eds.), *The self in social interaction* (pp. 299–308). New York: Wiley.

Gergen, K. J. (1991). *The saturated self.* New York: Basic Books.

Giddens, A. (1984). *The constitution of society.* Oxford, England: Polity Press.

Gilmore, P., & Glatthorn, A. A. (Eds.). (1982). *Children in and out of school: Ethnography and education.* Washington, DC: Center for Applied Linguistics.

Goddard, C. (1997). Constrastive semantics and cultural psychology: "Surprise" in Malay and English. *Culture and Psychology, 2,* 153–181.

Goddard, C. (2001). Lexico-semantic universals: A critical overview. *Linguistic Typology, 5,* 1–66.

Goddard, C., & Wierzbicka, A. (1994). *Semantic and lexical universals: Theory and empirical findings.* Amsterdam: Benjamins.

Göncü, A. (Ed.). (1999). *Children's engagement in the world.* New York: Cambridge University Press.

Göncü, A., Patt, J., & Kouba, E. (2002). Understanding young children's play in context. In P. Smith & C. Hart (Eds.), *Handbook of social development.* London: Blackwell.

Gone, J. P. (1999). We were through as keepers of it: The "missing pipe narrative" and Gros Ventre cultural identity. *Ethos, 27*(4), 415–440.

González, N. (2001). *I am my language: Discourses of women and children in the borderlands.* Tucson: University of Arizona Press.

Goodnow, J. J. (1990a). The socialization of cognition: What's involved. In J. W. Stigler, R. A. Shweder, & G. Herdt (Eds.), *Cultural psychology: Essays on comparative human development* (pp. 259–286). New York: Cambridge University Press.

Goodnow, J. J. (1990b). Using sociology to extend psychological accounts of cognitive development. *Human Development, 33,* 81–107.

Goodnow, J. J. (1995). Acceptable disagreement across generations. In J. Smetana (Ed.), *Parents' socio-cognitive models of development: New directions for child development* (pp. 51–64). San Francisco: Jossey-Bass.

Goodnow, J. J. (1996a). Acceptable ignorance, negotiable disagreement: Alternative views of learning. In D. Olson & N. Torrance (Eds.), *Handbook of psychology in education* (pp. 345–368). Oxford, England: Blackwell.

Goodnow, J. J. (1996b). Collaborative rules: How are people supposed to work with one another. In P. B. Baltes & U. M. Staudinger (Eds.), *Interactive minds: Life-span perspectives on the social foundation of cognition* (pp. 163–197). New York: Cambridge University Press.

Goodnow, J. J. (1996c). From household practices to parents' ideas about work and interpersonal relationships. In S. Harkness & C. Super (Eds.), *Parents' cultural belief systems* (pp. 313–344). New York: Guilford Press.

Goodnow, J. J. (1997). Parenting and the "transmission" and "internalization" of values: From social-cultural perspectives to within-family analyses. In J. E. Grusec & L. Kuczynski (Eds.), *Handbook of parenting and the transmission of values* (pp. 333–361). New York: Wiley.

Goodnow, J. J. (2004a, April). *Development as changing participation.* Paper presented at biennial meeting of Child Development Association, Washington, DC.

Goodnow, J. J. (2004b). Relational models theory: The domain of household work. In N. Haslam (Ed.), *Relational models theory: Applications in research and practice.* Mahwah, NJ: Erlbaum.

Goodnow, J. J. (in press). Contexts, diversity, pathways: Linking and expanding with a view to theory and practice. In C. R. Cooper, C. García Coll, T. Bartko, H. Davis, & C. Chapman (Eds.), *Hills of gold: Rethinking diversity and contexts as resources for children's developmental pathways.* New York: Oxford University Press.

Goodnow, J. J., Miller, P. J., & Kessel, F. (Eds.). (1995). *Cultural practices as contexts for development: Vol. 67. New directions for child development.* San Francisco: Jossey-Bass.

Goodwin, M. H. (1990). *He-said-she-said: Talk as social organization among black children.* Bloomington: Indiana University Press.

Goody, E. (1982). *Parenthood and social reproduction.* Cambridge, England: Cambridge University Press.

Gopnik, A. (1993). Psychopsychology. *Consciousness and Cognition, 2,* 264–280.

Gottlieb, A. (2004). *The afterlife is where we came from: The culture of infancy in West Africa.* Chicago: University of Chicago Press.

Gottlieb, G. (1991). The experiential canalization of behavioral development. *Developmental Psychology, 27,* 4–13.

Greenfield, P. (1997). Culture as process: Empirical methodology for cultural psychology. In J. W. Berry, Y. H. Poortinga, & J. Pandey (Eds.), *Handbook of cross-cultural psychology: Vol. 1. Theory and method.* Boston: Allyn & Bacon.

Greenfield, P., & Cocking, R. (1994). *Cross-cultural roots of minority child development.* Hillsdale, NJ: Erlbaum.

Greenfield, P. M., Keller, H., Fuligni, A., & Maynard, A. (2003). Cultural pathways through development. *Annual Review of Psychology, 54,* 461–490.

Grossmann, K. E., & Grossmann, K. (1981). Parent-infant attachment relationships in Bielefeld. In K. Immelman, G. Barlow, L. Petrovich, & M. Main (Eds.), *Behavioral development: The Bielefeld interdisciplinary project.* New York: Cambridge University Press.

Grossmann, K., & Grossmann, K. E. (1991). Newborn behavior, the quality of early parenting and later toddler-parent relationships in a group of German infants. In J. K. Nugent, B. M. Lester, & T. B. Brazelton (Eds.), *The cultural context of infancy* (Vol. 2). Norwood, NJ: Ablex.

Grossmann, K., Grossmann, K. E., Spangler, G., Suess, G., & Unzner, L. (1985). Maternal sensitivity and newborns' orientation responses as related to quality of attachment in northern Germany. In I. Bretherton & E. Waters (Eds.), *Monographs of the Society for Research in Child Development: Growing points of attachment theory and research, 50*(Serial Nos. 1–2). Chicago: University of Chicago Press.

Guisinger, S., & Blatt, S. J. (1994). Individuality and relatedness: Evolution of a fundamental dialect. *American Psychologist, 49,* 104–111.

Gutiérrez, K. D. (2002). Studying cultural practices in urban learning communities. *Human Development, 45,* 312–321.

Haidt, J., Koller, S., & Dias, M. (1993). Affect, culture, and morality, or is it wrong to eat your dog? *Journal of Personality and Social Psychology, 65,* 613–628.

Haight, W. L., & Miller, P. J. (1993). *Pretending at home: Early development in sociocultural context.* Albany: State University of New York Press.

Haight, W. L., Wang, X., Fung, H., Williams, K., & Mintz, J. (1999). Universal, developmental, and variable aspects of young children's play: A cross-cultural comparison of pretending at home. *Child Development, 70,* 1477–1488.

Hallowell, A. I. (1955). *Culture and experience.* Philadelphia: University of Pennsylvania Press.

Hamaguchi, E. (1985). A contextual model of the Japanese: Toward a methodological innovation in Japan studies. *Journal of Japanese Studies, 11,* 289–321.

Han, J. J., Leichtman, M. D., & Wang, Q. (1998). Autobiographical memory in Korean, Chinese, and American children. *Developmental Psychology, 34*(4), 701–713.

Hanks, W. F. (1996). *Language and communicative practices.* Boulder, CO: Westview Press.

Harkness, S., & Super, C. M. (1992). The cultural foundations of fathers' roles: Evidence from Kenya and the United States. In B. S. Hewlett (Ed.), *Father-child relations: Cultural and biosocial contexts.* New York: Aldine de Gruyter.

Harkness, S., & Super, C. M. (Eds.). (1996). *Parents' cultural belief systems.* New York: Guilford Press.

Hart, D. (1988). The adolescent self-concept in social context. In D. Lapsley & F. Power (Eds.), *Self, ego, and identity: Integrative approaches* (pp. 71–90). New York: Springer-Verlag.

Hart, D., & Edelstein, W. (1992). The relationship of self-understanding in childhood to social class, community type, and teacher-rated intellectual and social competence. *Journal of Cross-Cultural Psychology, 23*(3), 353–365.

Hart, D., Fegley, S., Hung Chan, Y., Mulvey, D., & Fischer, L. (1993). Judgment about personal identity in childhood and adolescence. *Social Development, 2*(1), 66–81.

Harter, S. (1983). Developmental perspectives on the self system. In E. M. Hetherington (Ed.), *Handbook of child psychology: Vol. 4. Socialization, personality, and social development.* New York: Wiley.

Harter, S. (1986). Processes underlying the construction, maintenance and enhancement of self-concept in children. In J. Suls & A. Greenwald (Eds.), *Psychological perspective on the self* (Vol. 3, pp. 136–182). Hillsdale, NJ: Erlbaum.

Harter, S. (1990). Causes, correlates and the functional role of global self-worth: A life span perspective. In R. J. Sternberg & J. J. Kolligian (Eds.), *Competence considered* (pp. 67–97). New Haven, CT: Yale University Press.

Harter, S. (1996). Historical roots of contemporary issues involving self-concept. In B. A. Bracken (Ed.), *Handbook of self-concept.* New York: Wiley.

Harwood, R., Leyendecker, B., Carlson, V., Asencio, M., & Miller, A. (2002). Parenting among Latino families in the US. In M. H. Bornstein (Ed.), *Handbook of parenting: Vol. 4. Social conditions and applied parenting* (2nd ed., pp. 21–46). Mahwah, NJ: Erlbaum.

Harwood, R., & Miller, J. (1991). Perceptions of attachment behavior: A comparison of Anglo and Puerto-Rican mothers. *Merrill-Palmer Quarterly, 3*(4), 583–599.

Harwood, R. L., Miller, J. G., & Irizarry, N. L. (1995). *Culture and attachment: Perceptions of the child in context.* New York: Guilford Press.

Harwood, R. L., Schoelmerish, A., Ventura-Cook, E., Schulze, P., & Wilson, S. (1996). Culture and class influences on Anglo and Puerto-Rican mothers: Regarding long-term socialization goals and child behavior. *Child Development, 62,* 2446–2462.

Hatano, G. (1995). The psychology of Japanese literacy: Expanding "the practice account." In L. Martin, K. Nelson, & E. Tobach (Eds.), *Sociocultural psychology: Theory and practice of doing and knowing* (pp. 250–275). New York: Cambridge University Press.

Hatano, G., & Inagaki, K. (1986). Two courses of expertise. In H. Stevenson, H. Azuma, & K. Hakuta (Eds.), *Child development and education in Japan* (pp. 262–272). San Francisco: Freeman.

Hatano, G., & Inagaki, K. (1992). Desituating cognition through the construction of conceptual knowledge. In P. Light & G. Butterworth (Eds.), *Context and cognition: Ways of learning and knowing* (pp. 115–133). London: Harvester Wheatsheaf.

Hatano, G., & Inagaki, K. (2000). Domain-specific constraints of conceptual development. *International Journal of Behavioral Development, 24,* 267–275.

Hatano, G., Okada, N., & Tanabe, H. (Eds.). (2001). *Affective minds.* Amsterdam: Elsevier.

Hatano, G., Siegler, R. S., Richards, D. D., Inagaki, K., Stavy, R., & Wax, N. (1993). The development of biological knowledge: A multi-national study. *Cognitive Development, 8,* 47–62.

Hatano, G., & Wertsch, J. V. (Eds.). (2001). *Cultural minds: Human Development, 44*(Serial Nos. 2–3) [Special issue].

Hatchett, S. J., Cochran, D. L., & Jackson, J. S. (1991). Family life. In J. S. Jackson (Ed.), *Life in Black America* (pp. 46–83). Newbury Park, CA: Sage.

He, A. W. (2001). The language of ambiguity: Practices in Chinese heritage language classes. *Discourse Studies, 3*(1), 75–96.

Heath, S. B. (1983). *Ways with words: Language, life and work in communities and classrooms.* New York: Cambridge University Press.

Heine, S. H., Lehman, D. R., Markus, H. R., & Kitayama, S. (1999). Is there a universal need for positive self-regard? *Psychological Review, 106*(4), 766–794.

Heine, S. J., Kitayama, S., Lehman, D. R., Takata, T., Ide, E., Leung, C., et al. (2001). Divergent consequences of success and failure in Japan and North America: An investigation of self-improving motivations and malleable selves. *Journal of Personality and Social Psychology, 81*(4), 599–615.

Herdt, G. (1981). *Guardians of the flutes.* New York: McGraw-Hill.

Herdt, G. (1990). Sambia nosebleeding rites and male proximity to women. In J. Stigler, R. A. Shweder, & G. Herdt (Eds.), *Cultural psychology: Essays on comparative human development.* New York: Cambridge University Press.

Hewlett, B. S. (1991). *Intimate fathers: The nature and context of Aka Pygmy paternal infant care.* Ann Arbor: University of Michigan Press.

Hewlett, B. S. (Ed.). (1992). *Father-child relations: Cultural and biosocial contexts.* New York: Aldine de Gruyter.

Hicks, D. A. (1994). Individual and social meanings in the classroom: Narrative discourse as a boundary phenomenon. *Journal of Narrative and Life History, 4,* 215–240.

Higgins, E. T. (1990). Self-state representations: Patterns of interconnected beliefs with specific holistic meanings and importance. *Bulletin of the Psychonomic Society, 28,* 248–253.

Higgins, E. T., & Parsons, J. (1983). Social cognition and the social life of the child: Stages as subcultures. In E. T. Higgins, D. N. Ruble, & W. W. Hartup (Eds.), *Social cognition and social development: A sociocultural perspective* (pp. 15–62). New York: Cambridge University Press.

Ho, D. Y. (1993). Relational orientation in Asian social psychology. In U. Kim & J. W. Berry (Eds.), *Indigenous psychologies: Research and experiences in cultural context.* Newbury Park, CA: Sage.

Holland, D., Lachicotte, W., Jr., Skinner, D., & Cain, C. (1998). *Identity and agency in cultural worlds.* Cambridge, MA: Harvard University Press.

Holland, D. C., & Quinn, N. (Eds.). (1987). *Cultural models in language and thought.* New York: Cambridge University Press.

Howard, A. (1985). Ethnopsychology and the prospects for a cultural psychology. In G. M. White & J. Kirkpatrick (Eds.), *Person, self and experience: Exploring specific ethnopsychologies.* Berkeley: University of California Press.

Hudley, E. V. P., Haight, W., & Miller, P. J. (2003). *"Raise up a child": Human development in an African American family.* Chicago: Lyceum.

Hughes, D., & Chen, L. (1999). The nature of parents' race-related communications to children: A developmental perspective. In L. Balter & C. S. Tamis-LeMonda (Eds.), *Child psychology: A handbook of contemporary issues* (pp. 467–490). Philadelphia: Psychology Press.

Hymes, D. (1974). *Foundations in sociolinguistics: An ethnographic approach* (pp. 29–66). Philadelphia: University of Pennsylvania Press.

Ikegama, Y. (1991). "DO-language" and "BECOME-language": Two contrasting types of linguistic representation. In Y. Ikegama (Ed.), *The empire of signs: Semiotic Essays on Japanese Culture* (Vol. 8, pp. 286–327). Philadelphia: Benjamins.

Inagaki, K. (1990). The effects of raising animals on children's biological knowledge. *British Journal of Developmental Psychology, 8,* 119–129.

Inagaki, K., & Hatano, G. (2002). *Young children's naive thinking about the biological world.* New York: Psychology Press.

Ingold, T. (1986). *Evolution and social life.* New York: Cambridge University Press.

Ingold, T. (1991). Becoming persons: Consciousness and sociality in human evolution. *Cultural Dynamics, 4*(3), 355–378.

Ishii, K., & Kitayama, S. (2001). Spontaneous attention to emotional speech in Japan and the United states. In G. Hatano, N. Okada, & H. Tanabe (Eds.), *Affective minds* (pp. 243–248). Amsterdam: Elsevier.

Jahoda, G. (1990). Our forgotten ancestors. In J. J. Berman (Ed.), *Nebraska Symposium on Motivation, 1989: Cross-cultural perspectives* (pp. 1–40). Lincoln: University of Nebraska Press.

Jahoda, G. (1992). *Crossroads between culture and mind: Continuities and change in theories of human nature.* Cambridge, MA: Harvard University Press.

James, W. (1950). *The principles of psychology.* New York: Dover.

Jensen, L. A. (1996). *Different habits, different hearts: Orthodoxy and progressivism in the United States and India.* Unpublished PhD thesis, University of Chicago, Illinois.

Jensen, L. A. (2005). *Through two lenses: A cultural-developmental approach to moral psychology.* Available from JensenL@cua.edu.

Jessor, R., Colby, A., & Shweder, R. A. (Eds.). (1996). *Ethnography and human development: Context and meaning in social inquiry.* Chicago: University of Chicago Press.

Johnson, F. (1985). The Western concept of self. In A. Marsella, G. DeVos, & F. L. K. Hsu (Eds.), *Culture and self.* London: Tavistock.

Josephs, R. A., Markus, H., & Tarafodi, R. W. (1992). Gender and self-esteem. *Journal of Personality and Social Psychology, 63,* 391–402.

Kakar, S. (1978). *The inner world: A psychoanalytic study of childhood and society in India.* New York: Oxford University Press.

Kakar, S. (1982). *Shamans, mystics and doctors.* Boston: Beacon Press.

Kakar, S. (1996). *The colors of violence: Cultural identities, religion and conflict.* Chicago: University of Chicago Press.

Kapstein, M. (1989). Santaraksita on the fallacies of personalistic vitalism. *Journal of Indian Philosophy, 17,* 43–59.

Karasawa, M. (1998). *The cultural basis of self- and other-perceptions: Self-criticism and other-enhancement in Japan.* Unpublished PhD dissertation, Shirayuri College, Tokyo, Japan.

Karmiloff-Smith, A. (1992). *Beyond modularity.* Cambridge, MA: MIT Press.

Keil, F. C. (1984). Mechanisms in cognitive development and the structure of knowledge. In R. J. Sternberg (Ed.), *Mechanisms of cognitive development* (pp. 81–99). New York: Freeman.

Kessel, F. S., & Siegel, A. W. (Eds.). (1983). *The child and other cultural inventions.* New York: Praeger.

Kessen, W. (1983). The child and other cultural inventions. In F. S. Kessel & A. W. Siegel (Eds.), *The child and other cultural inventions.* New York: Praeger.

Kessen, W. (Ed.). (1990). *The rise and fall of development.* Worcester, MA: Clark University Press.

Kihlstrom, J. F., & Cantor, N. (1984). Mental representations of the self. *Advances in Experimental Social Psychology, 17,* 1–47.

Kim, U. (1987). *The parent-child relationship: The core of Korean collectivism.* Paper presented at the meeting of the International Association for Cross-Cultural Psychology, Newcastle, Australia.

Kitayama, S., & Markus, H. R. (1994). *Emotion and culture: Empirical studies of mutual influences.* Washington, DC: American Psychological Association.

Kitayama, S., Markus, H., Matsumoto, H., & Norasakkunkit, V. (1995). *Individual and collective processes of self-esteem management: Self enhancement in the United States and self-depreciation in Japan.* Kyoto, Japan: Kyoto University.

Kitayama, S., Markus, H. R., Matsumoto, H., & Norasakkunkit, V. (1997). Individual and collective processes in the construction of the self: Self-enhancement in the United States and self-criticism in Japan. *Journal of Personality and Social Psychology, 72*(6), 1245–1267.

Kondo, D. (1990). *Crafting selves: Power, gender, and discourses of identity in a Japanese workplace.* Chicago: University of Chicago Press.

Konner, M. J. (1975). Relations among infants and juveniles in comparative perspective. In M. Lewis & L. Rosenblum (Eds.), *Friendship and peer relations.* New York: Wiley.

Kratz, C. (1994). *Affecting performance: Meaning, movement and experience in Okiek women's initiation.* Washington, DC: Smithsonian Institution Press.

Kripal, J. (1995). *Kali's child: The mystical and the erotic in the life and teachings of Rama Krishna.* Chicago: University of Chicago Press.

Kristeva, J. (1980). *Desire in language: A semiotic approach to literature and art.* New York: Columbia University Press.

Kuebli, J., & Fivush, R. (1992). Gender differences in parent-child conversations about past emotions. *Sex Roles, 27,* 683–698.

Kulick, D. (1992). *Language shifts and cultural reproduction: Socialization, self, and syncretism in a Papua New Guinean village.* New York: Cambridge University Press.

Kurtz, S. N. (1992). *All the mothers are one: Hindu India and the cultural reshaping of psychoanalysis.* New York: Columbia University Press.

Kusserow, A. S. (1999). De-homogenizing American individualism: Socializing hard and soft individualism in Manhattan and Queens. *Ethos, 27*(2), 210–234.

Laboratory of Comparative Human Cognition. (1983). Culture and cognitive development. In P. Mussen (Series Ed.) & W. Kessen (Vol. Ed.), *Handbook of child psychology: Vol. 1. History, theory and methods.* New York: Wiley.

Lampert, M., Rittenhouse, P., & Crumbaugh, C. (1996). Agreeing to disagree: Developing sociable mathematical discourse. In D. R. Olson & N. Torrance (Eds.), *Handbook of education and human development: New models of learning, teaching, and schooling* (pp. 731–764). Cambridge, MA: Blackwell.

Lancy, D. (1996). *Playing on the mother ground: Cultural routines for children's development.* New York: Guilford Press.

Lave, J. (1990). *Cognition in practice: Mind, mathematics, and culture in everyday life.* Cambridge, England: Cambridge University Press.

Lave, J. (1991). Situating learning in communities of practice. In L. B. Resnick, J. M. Levine, & S. D. Teasley (Eds.), *Perspectives on socially shared cognition* (pp. 63–82). Washington, DC: American Psychological Association.

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation.* New York: Cambridge University Press.

Leadbeater, B. J., & Dionne, J. P. (1981). The adolescent's use of formal operational thinking in solving problems related to identity resolutions. *Adolescence, 16,* 111–121.

Leahy, R., & Shirk, S. (1985). Social cognition and the development of the self. In R. Leahy (Ed.), *The development of the self.* New York: Academic Press.

Lebra, T. S. (1976). *Japanese patterns of behavior.* Honolulu: University of Hawaii Press.

Lebra, T. S. (1992). *Culture, self, and communication.* Ann Arbor: University of Michigan.

Lebra, T. S. (1993). Culture, self, and communication in Japan and the United States. In W. B. Gudykunst (Ed.), *Communication in Japan and the United States* (pp. 51–87). Albany: State University of New York Press.

Lebra, T. S. (1994). Mother and child in Japanese socialization: A Japan-US comparison. In P. M. Greenfield & R. R. Cocking (Eds.), *Cross-cultural roots of minority child development* (pp. 259–274). Hillsdale, NJ: Erlbaum.

LeVine, L. E. (1983). Mine: Self-definition in 2-year-old-boys. *Developmental Psychology, 19,* 544–549.

LeVine, R. A. (1970). Cross-cultural study in child psychology. In P. H. Mussen (Ed.), *Carmichael's manual of child psychology* (3rd ed.). New York: Wiley.

LeVine, R. A. (1978). Western schools in non-Western societies: Psychosocial impact and cultural response. *Teachers College Record, 79.*

LeVine, R. A. (1989). Cultural environments in child development. In W. Damon (Ed.), *Child development today and tomorrow.* San Francisco: Jossey-Bass.

LeVine, R. A. (1990a). Enculturation: A biosocial perspective on the self. In D. Cicchetti & M. Beeghly (Eds.), *The self in transition: Infancy to childhood.* Chicago: University of Chicago Press.

LeVine, R. A. (1990b). Infant environments in psychoanalysis: A cross-cultural view. In J. W. Stigler, R. A. Shweder, & G. Herdt (Eds.), *Cultural psychology: Essays on comparative human development* (pp. 454–474). New York: Cambridge University Press.

LeVine, R. A. (2004). Challenging expert knowledge: Findings from an African study of child care and development. In U. P. Gielen & J. P. Roopnaraine (Eds.), *Childhood and adolescence in cross-cultural perspective.* Westport, CT: Greenwood Press.

LeVine, R. A., Dixon, S., LeVine, S., Richman, A., Leiderman, P. H., Keefer, C., et al. (1994). *Child care and culture: Lessons from Africa.* New York: Cambridge University Press.

LeVine, R. A., & LeVine, B. B. (1966). *Nyansongo: A Gusii community in Kenya.* New York: Wiley.

LeVine, R. A., LeVine, S., Iwanaga, M., & Marvin, R. (1970). *Child care and social attachment in a Nigerian community: A preliminary report.* Paper presented at the American Psychological Association meetings.

LeVine, R. A., Miller, P., & West, M. (Eds.). (1988). *Parental behavior in diverse societies.* San Francisco: Jossey-Bass.

LeVine, R. A., & Norman, K. (2001). The infant's acquisition of culture: Early attachment re-examined from an anthropological perspective. In C. Moore & H. Mathews (Eds.), *The psychology of cultural experience.* New York: Cambridge University Press.

LeVine, S. (n.d.). *Caregiving in Godavari, Nepal, 1990* [Videotape].

Levy, R. I. (1973). *Tahitians: Mind and experience in the Society Islands.* Chicago: University of Chicago Press.

Levy, R. I. (1984). Emotion, knowing and culture. In R. A. Shweder & R. A. LeVine (Eds.), *Culture theory: Essays on mind, self and emotion.* New York: Cambridge University Press.

Lewin, K. (1943). Defining the field at given time. *Psychological Review, 50,* 292–310.

Lewis, C. C. (1995). *Educating hearts and minds.* New York: Cambridge University Press.

Lewis, M. (1993). Self-conscious emotions: Embarrassment, pride, shame, and guilt. In M. Lewis & J. Haviland (Eds.), *Handbook of emotions* (pp. 563–573). New York: Guilford Press.

Lewis, M., Sullivan, M., Stanger, C., & Weiss, M. (1989). Self-development and self-conscious emotions. *Child Development, 60,* 146–156.

Li, J. (2002). A cultural model of learning: Chinese "heart and mind for wanting to learn." *Journal of Cross-Cultural Psychology, 33,* 246–267.

Li, J. (2004). "I learn and grow big": Chinese preschoolers' purposes for learning. *International Journal of Behavioral Development, 28,* 116–128.

Lifton, R. J. (1993). *The Protean self.* New York: Harper.

Lillard, A. (1996). Body or mind: Children's categorizing of pretense. *Child Development, 67*(4), 1717–1734.

Little, T. O., Oettingen, G., Stetsenko, A., & Baltes, P. B. (1995). *Children's school performance-related beliefs: How do American children compare to German and Russian children.* Berlin, Germany: Max Planck Institute for Human Development and Education.

Lohmann, H., & Tomasello, M. (2003). The role of language in the development of false belief understanding: A training study. *Child Development, 74,* 1130–1144.

Lucy, J. A. (1992a). *Grammatical categories and cognition: A case study of the linguistic relativity hypothesis.* New York: Cambridge University Press.

Lucy, J. A. (1992b). *Language diversity and thought: A reformulation of the linguistic relativity hypothesis.* New York: Cambridge University Press.

Lutz, C. (1988). *Unnatural emotions: Everyday sentiments on a Micronesian Atoll and their challenge to Western theory.* Chicago: University of Chicago Press.

Lutz, C., & White, G. (1986). The anthropology of emotions. *Annual Review of Anthropology, 15,* 405–436.

Malinowski, B. (1922). *Argonauts of the Western Pacific.* New York: Dutton.

Mandelbaum, D. G. (Ed.). (1951). *Selected writings of Edward Sapir in language, culture, and personality.* Berkeley: University of California Press.

Markus, H. R., & Kitayama, S. (1991a). Cultural variation in the self-concept. In J. Strauss & G. R. Goethals (Eds.), *The self: Interdisciplinary approaches* (pp. 18–48). New York: Springer-Verlag.

Markus, H. R., & Kitayama, S. (1991b). Culture and the self: Implications for cognition, emotion, and motivation. *Psychological Review, 98,* 224–253.

Markus, H. R., & Kitayama, S. (1994a). The cultural construction of self and emotion: Implications for social behavior. In S. Kitayama & H. R. Markus (Eds.), *Emotion and culture: Empirical studies of mutual influences* (pp. 89–130). Washington, DC: American Psychological Association.

Markus, H. R., & Kitayama, S. (1994b). The cultural shaping of emotion: A conceptual framework. In S. Kitayama & H. R. Markus (Eds.), *Emotion and culture: Empirical studies of mutual influences* (pp. 339–351). Washington, DC: American Psychological Association.

Markus, H., & Kitayama, S. (2003). Models of agency: Sociocultural diversity in the construction of action. In R. A. Dienstbier (Series Ed.) & V. Murphy-Berman & J. J. Berman (Vol. Eds.), *Nebraska Symposium on Motivation: Vol. 49. Cross-cultural differences in perspectives on the self* (pp. 1–57). Lincoln: University of Nebraska Press.

Markus, H. R., Kitayama, S., & Heiman, R. J. (1996). Culture and "basic" psychological principles. In E. T. Higgins & A. W. Kruglanski (Eds.), *Social psychology: Handbook of basic principles.* New York: Guilford Press.

Markus, H. R., Mullally, P. R., & Kitayama, S. (1997). Collective self-schemas: The sociocultural grounding of the personal. In U. Neisser & D. Jopling (Eds.), *The conceptual self in context: Culture, experience, self-understanding.* Cambridge, England: Cambridge University Press.

Markus, H. R., & Nurius, P. (1986). Possible selves. *American Psychologist, 41,* 954–969.

Markus, H. R., & Wurf, E. (1986). The dynamic self-concept: A social psychological perspective. *Annual Review of Psychology, 38,* 299–337.

Martin, L., Nelson, D., & Tobach, E. (1995). *Sociocultural psychology: Theory and practice of doing and knowing.* New York: Cambridge University Press.

Martin-Barbero, J. (1993). *Communication, culture and hegemony: From media to mediations.* Thousand Oaks, CA: Sage.

Martini, M. (1994). Peer interactions in Polynesia: A view from the Marquesas. In J. L. Roopmarine, J. E. Johnson, & F. H. Hooper (Eds.), *Children's play in diverse cultures.* Albany: State University of New York Press.

Marvin, R., VanDevender, T., Iwanaga, M., LeVine, S., & LeVine, R. (1977). Infant-caregiver attachment among the Hausa of Nigeria. In H. McGurk (Ed.), *Ecological factors in human development.* Amsterdam: North-Holland.

Maslow, A. H. (1954). *Motivation and personality.* New York: Harper.

Masten, A. S. (1999). Cultural processes of child development. *Minnesota Symposia on Child Development* (29).

McAdoo, H. P. (2002). African American parenting. In M. H. Bornstein (Ed.), *Handbook of parenting: Vol. 4. Social conditions and applied parenting* (2nd ed., pp. 47–58). Mahwah, NJ: Erlbaum.

McCabe, A., & Peterson, A. (1991). *Developing narrative structure.* Hillsdale, NJ: Erlbaum.

McKenna, J. J., Thoman, E. B., Anders, T. F., Sadeh, A., Schechtman, V. L., & Glotzbach, S. F. (1993). Infant-parent co-sleeping in an evolutionary perspective: Implications for understanding infant sleep development and the sudden infant death syndrome. *Sleep, 16,* 263–282.

Mead, G. H. (1934). *Mind, self, and society.* Chicago: University of Chicago Press.

Mead, M. (1931). *A handbook of child psychology* (Carl Murchison, Ed.). Worcester, MA: Clark University Press.

Medin, D. L. (1989). Concepts and conceptual structure. *American Psychologist, 89,* 1969–1981.

Meng, K. (1992). Narrating and listening in kindergarten. *Journal of Narrative and Life History, 2*(3), 235–276.

Menon, U. (1995). *Receiving and giving: Distributivity as the source of women's wellbeing.* Unpublished PhD thesis, University of Chicago, IL.

Menon, U. (2002). Neither victim nor rebel: Feminism and the morality of gender and family life in a Hindu temple town. In R. A. Shweder, M. Minow, & H. R. Markus (Eds.), *Engaging cultural differences: The multicultural challenge in liberal democracies* (pp. 288–308). New York: Russell Sage Foundation.

Menon, U., & Shweder, R. (1994). Kali's tongue: Cultural psychology and the power of shame in Orissa, India. In S. Kitayama & H. R. Markus (Eds.), *Emotion and culture: Empirical studies of mutual influence* (pp. 241–284). Washington, DC: American Psychological Association.

Mesquita, B. (2001). Culture and emotion: Different approaches to the question. In T. J. Mayne & G. A. Bonanno (Eds.), *Emotions: Current issues and future directions* (pp. 214–250). New York: Guilford Press.

Mesquita, B., & Frijda, N. H. (1992). Cultural variations in emotions: A review. *Psychological Bulletin, 112,* 179–204.

Michaels, S. (1991). The dismantling of narrative. In A. McCabe & C. Peterson (Eds.), *Developing narrative structure* (pp. 303–351). Hillsdale, NJ: Erlbaum.

Miller, J. G. (1984). Culture and the development of everyday social explanation. *Journal of Personality and Social Psychology, 46,* 961–978.

Miller, J. G. (1994a). Cultural diversity in the morality of caring. *Cross-Cultural Research, 28,* 3–39.

Miller, J. G. (1994b). Cultural psychology: Bridging disciplinary boundaries in understanding the cultural grounding of self. In P. K. Bock (Ed.), *Handbook of psychological anthropology.* Westport, CT: Greenwood Press.

Miller, J. G. (1997a). Culture and self: Uncovering the cultural grounding of psychological theory. In J. G. Snodgrass & R. L. Thompson (Eds.), *The self across psychology: Self-recognition, self-awareness, and the self concept* (pp. 217–231). New York: New York Academy of Sciences.

Miller, J. G. (1997b). Theoretical issues in cultural psychology and social constructionism. In J. W. Berry, Y. Poortinga, & J. Pandey (Eds.), *Handbook of cross-cultural psychology: Theoretical and methodological perspectives* (Vol. 1). Boston: Allyn & Bacon.

Miller, J. G. (2003). Culture and agency: Implications for psychological theories of motivation and social development. In R. A. Dienstbier (Series Ed.) & V. Murphy-Berman & J. J. Berman (Vol. Eds.), *Nebraska Symposium on Motivation: Vol. 49. Cross-Cultural difference in perspectives on the self* (pp. 59–99). Lincoln: University of Nebraska Press.

Miller, P. J. (1982). *Amy, Wendy, and Beth: Learning language in South Baltimore.* Austin: University of Texas Press.

Miller, P. J. (1994). Narrative practices: Their role in socialization and self construction. In U. Neisser & R. Fivush (Eds.), *The remembering self: Construction and accuracy in the self-narrative* (pp. 158–179). New York: Cambridge University Press.

Miller, P. J., Fung, H., & Mintz, J. (1996). Self-construction through narrative practices: A Chinese and American comparison of early socialization. *Ethos, 24,* 237–279.

Miller, P. J., & Goodnow, J. J. (1995). Cultural practices: Toward an integration of development and culture. In J. J. Goodnow, P. J. Miller, & F. Kessel (Eds.), *Cultural practices as contexts for development: New directions for child development* (Vol. 67, pp. 5–16). San Francisco: Jossey-Bass.

Miller, P. J., Hengst, J. A., & Wang, S.-H. (2003). Ethnographic methods: Applications from developmental cultural psychology. In P. Camic, J. Rhodes, & L. Yardley (Eds.), *Qualitative research in psychology: Expanding perspectives in methodology and design.* Washington, DC: American Psychological Association.

Miller, P. J., & Hoogstra, L. (1992). Language as tool in the socialization and apprehension of cultural meanings. In T. Schwartz, G. M. White, & G. A. White (Eds.), *New directions in psychological anthropology* (pp. 83–101). New York: Cambridge University Press.

Miller, P. J., Hoogstra, L., Mintz, J., Fung, H., & Williams, K. (1993). Troubles in the garden and how they get resolved: A young child's transformation of his favorite story. In C. A. Nelson (Ed.), *Minnesota Symposia on Child Psychology: Vol. 26. Memory and affect in development* (pp. 87–114). Hillsdale, NJ: Erlbaum.

Miller, P. J., Mintz, J., Fung, H., Hoogstra, L., & Potts, R. (1992). The narrated self: Young children's construction of self in relation to others in conversational stories of personal experience. *Merrill-Palmer Quarterly, 38,* 45–67.

Miller, P. J., & Moore, B. B. (1989). Narrative conjunctions of caregiver and child: A comparative perspective on socialization through stories. *Ethos, 17,* 43–64.

Miller, P. J., Potts, R., Fung, H., Hoogstra, L., & Mintz, J. (1990). Narrative practices and the social construction of self in childhood. *American Ethnologist, 17*(2), 292–311.

Miller, P. J., Sandel, T., Liang, C.-H., & Fung, H. (2001). Narrating transgressions in Longwood: The discourses, meanings, and paradoxes of an American socializing practice. *Ethos, 29*(2), 1–27.

Miller, P. J., & Sperry, L. L. (1987). The socialization of anger and aggression. *Merrill-Palmer Quarterly, 33,* 1–31.

Miller, P. J., Wiley, A., Fung, H., & Liang, C. (1997). Personal storytelling as a medium of socialization in Chinese and American families. *Child Development, 68,* 557–568.

Minsky, M. (2000). Attachments and goals. In G. Hatano, N. Okada, & H. Tanabe (Eds.), *Affective minds* (pp. 27–40). Amsterdam: Elsevier.

Minsky, M. (2001). *The emotion machine.* New York: Pantheon.

Montemayor, R., & Eisen, M. (1977). The development of self-conceptions from childhood to adolescence. *Developmental Psychology, 13,* 314–319.

Morelli, G. A., Rogoff, B., Oppenheimer, D., & Goldsmith, D. (1992). Cultural variations in infants' sleeping arrangements: Question of independence. *Developmental Psychology, 28,* 604–613.

Morikawa, H., Shand, N., & Kosawa, Y. (1988). Maternal speech to prelingual infants in Japan and the United States: Relationships among functions, forms and referents. *Journal of Child Language, 15,* 237–256.

Morris, B. (1994). *Anthropology of the self: The concept of the individual in the west.* Boulder, CO: Pluto Press.

Much, N. C. (1992). The analysis of discourse as methodology for a semiotic psychology. *American Behavioral Scientist, 36,* 52–72.

Much, N. C. (1993). Personal psychology and cultural discourse: Context analysis in the construction of meaning and a women's devotional life in an Indian village. In J. Smith, R. Harre, & L. van Langenhove (Eds.), *Rethinking psychology: Vol. 1. Conceptual foundations.* London: Sage.

Much, N. C. (1995). Cultural psychology. In J. Smith, R. Harre, & L. van Langenhove (Eds.), *Rethinking psychology.* London: Sage.

Mulder, N. (1992). *Individual and society in Java: A cultural analysis* (2nd ed.). Yogyakarta, Indonesia: Gajah Mada University Press.

Mullen, M. K., & Yi, S. (1995). The cultural context of talk about the past: Implications for the development of autobiographical memory. *Cognitive Development, 10,* 407–419.

Munroe, R. H. (in press). Social structure and sex-role choices among children in four cultures. *Cross-Cultural Research.*

Murphy-Berman, V., & Berman, J. J. (Eds.). (2003). Cultural difference in perspectives on the self. In R. A. Dienstbier (Series Ed.), *Nebraska Symposium on Motivation: Vol. 49. Cross.* Lincoln: University of Nebraska Press.

Nag, M., White, B., & Peet, R. C. (1978). An anthropological approach to the study of the economic value of children. *Current Anthropology, 19,* 293–306.

Neisser, U. (1988). Five kinds of self-knowledge. *Philosophical Psychology, 1,* 35–59.

Neisser, U. (1991). Two perceptually given aspects of the self and their development. *Developmental Review, 11*(3), 197–209.

Neisser, U., & Fivush, R. (1994). *The remembering self: Construction and accuracy in the self-narrative.* New York: Cambridge University Press.

Neisser, U., & Jopling, D. (Eds.). (1997). *The conceptual self in context: Culture, experience, self-understanding.* Cambridge, England: Cambridge University Press.

Nelson, K. (Ed.). (1989). *Narratives from the crib.* Cambridge, MA: Harvard University Press.

Nelson, K. (1996). *Language in cognitive development: The emergence of the mediated mind.* New York: Cambridge University Press.

Nicolopoulou, A. (1997). Children and narratives: Toward an interpretive and sociocultural approach. In M. Bamberg (Ed.), *Narrative development: Six approaches* (pp. 179–215). Hillsdale, NJ: Erlbaum.

Nisbett, R. (2003). *The geography of thought.* New York: Free Press.

Nisbett, R., & Cohen, D. (1995). *The culture of honor: The psychology of violence in the South.* Boulder, CO: Westview Press.

Nunes, T. (1995). Cultural practices and the conception of individual differences: Theoretical and empirical considerations. In J. J. Goodnow, P. J. Miller, & F. Kessel (Eds.), *Cultural practices as contexts for development* (pp. 91–104). San Francisco: Jossey-Bass.

Ochs, E. (1988). *Culture and language development: Language acquisition and language socialization in a Samoan village.* Cambridge, England: Cambridge University Press.

Ochs, E. (1990). Indexicality and socialization. In J. W. Stigler, R. A. Shweder, & G. Herdt (Eds.), *Cultural psychology: Essays on comparative human development* (pp. 287–308). New York: Cambridge University Press.

Ochs, E. (1999). Socialization. *Journal of Linguistic Anthropology, 9*(1/2), 230–233.

Ochs, E., & Capps, L. (2001). *Living narrative: Creating lives in everyday storytelling.* Cambridge, MA: Harvard University Press.

Ochs, E., & Schieffelin, B. (1984). Language acquisition and socialization: Three developmental stories. In R. Shweder & R. A. LeVine (Eds.), *Culture theory: Essays on mind, self, and emotion.* New York: Cambridge University Press.

Ochs, E., & Taylor, C. E. (1995). The father knows best dynamic in dinnertime narratives. In K. Hall & M. Bucholtz (Eds.), *Gender articulated: Language and the socially constructed self* (pp. 97–120). New York: Routledge.

Oerter, R., Oerter, R., Agostiani, H., Kim, H., & Wibowo, S. (1996). The concept of human nature in East Asia: Etic and emic characteristics. *Culture and Psychology, 2*(1), 9–51.

Oettingen, G. (1995). Cross-cultural perspectives on self-efficacy. In A. Bandura (Ed.), *Self-efficacy in changing societies* (pp. 149–176). New York: Cambridge University Press.

Okami, P., & Weisner, T. (in press). Is parent-child bedsharing psychologically harmful? Data from the UCLA Family Lifestyles Project. In J. McKenna (Ed.), *Safe co-sleeping with baby: Scientific, medical and political perspectives.*

Okami, P., Weisner, T. S., & Olmstead, R. (2002). Outcome correlates of parent-child bedsharing: An 18-year longitudinal study. *Journal of Developmental and Behavioral Pediatrics, 23*(4), pp. 244–253.

Oosterwegel, A., & Oppenheimer, L. (1993). *The self-system: Developmental changes between and within self-concepts.* Hillsdale, NJ: Erlbaum.

Oura, Y., & Hatano, G. (2001). The constitution of general and specific mental models of other people. *Human Development, 44,* 144–159.

Oyserman, D., & Kemmelmeier, M. (1995, June). *Viewing oneself in light of others: Gendered impact of social comparisons in the achievement domain.* Paper presented at the 7th annual convention of the American Psychological Society, New York.

Oyserman, D., & Markus, H. R. (1993). The sociocultural self. In J. Suls (Ed.), *Psychological perspectives on the self* (Vol. 4, pp. 187–220). Hillsdale, NJ: Erlbaum.

Packer, M. J. (1987). Social interaction as practical activity: Implications for the study of social and moral development. In W. Kurtines & J. Gewirtz (Eds.), *Moral development through social interaction* (pp. 245–280). New York: Wiley.

Parish, S. (1991). The sacred mind: Newar cultural representations of mental life and the production of moral consciousness. *Ethos, 19*(3), 313–351.

Peak, L. (1987). *Learning to go to school in Japan: The transition from home to preschool life.* Berkeley: University of California Press.

Peak, L. (2001). Learning to become part of the group: The Japanese child's transition to preschool life. In H. Shimizu & R. A. LeVine (Eds.), *Japanese frames of mind: Cultural perspectives on human development* (pp. 143–169). New York: Cambridge University Press.

Peterson, C. C., & Siegal, M. (1995). Deafness, conversation and theory of mind. *Journal of Child Psychology and Psychiatry, 36,* 459–474.

Phelan, P., Davidson, A. L., & Yu, H. C. (1998). *Adolescents' worlds: Negotiating family, peers, and school.* Mahwah, NJ: Erlbaum.

Pike, K. L. (1967). *Language in relation to a unified theory of the structure of human behavior.* The Hague, The Netherlands: Mouton.

Polkinghorne, D. E. (1988). *Narrative knowing and the human sciences.* Albany: State University of New York Press.

Pratt, M. W., & Fiese, B. H. (2004). *Family stories and the life course: Across time and generations.* Mahwah, NJ: Erlbaum.

Preece, A. (1987). The range of narrative forms conversationally produced by young children. *Journal of Child Language, 14,* 353–373.

Redfield, R. (1941). *The folk culture of Yucatan.* Chicago: University of Chicago Press.

Richman, A., LeVine, R. A., New, R. S., Howrigan, G., Welles-Nystrom, B., & LeVine, S. (1988). Maternal behavior to infants in five societies. In R. A. LeVine, P. Miller, & M. M. West (Eds.), *Parental behavior in diverse societies: Vol. 40. New directions for child development.* San Francisco: Jossey-Bass.

Richman, A., Miller, P., & LeVine, R. A. (1992). Cultural and educational variations in maternal responsiveness. *Developmental Psychology, 28,* 614–621.

Rogoff, B. (1990). *Apprenticeship in thinking: Cognitive development in social context.* New York: Oxford University Press.

Rogoff, B. (2003). *The cultural nature of human development.* New York: Oxford University Press.

Rogoff, B., Mistry, J. J., Göncü, A., & Mosier, C. (1993). Guided participation in cultural activity by toddlers and caregivers. *Monographs of the Society for Research in Child Development, 58*(7, Series No. 236).

Rogoff, B., Radziszewska, B., & Masiello, T. (1995). Analysis of developmental processes in sociocultural activity. In L. M. Nelson & E. Tobach (Eds.), *Sociocultural psychology: Theory and practice of doing and knowing.* New York: Cambridge University Press.

Rohner, R. P. (1984). *Handbook for the study of parental acceptance and rejection* (Rev. ed.). Storrs: University of Connecticut.

Rohner, R. P., & Pettengill, S. (1985). Perceived parental acceptance-rejection and parental control among Korean adolescents. *Child Development, 56,* 524–528.

Romney, A. K., Weller, S. C., & Batchelder, W. H. (1986). Culture as consensus: A theory of culture and informant accuracy. *American Anthropologist, 88,* 313–332.

Rosaldo, M. Z. (1984). Toward an anthropology of self and feeling. In R. A. Shweder & R. A. LeVine (Eds.), *Culture theory: Essays on mind, self, and emotion* (pp. 137–157). New York: Cambridge University Press.

Rosen, L. (1995). *Other intentions.* Santa Fe, NM: School of American Research.

Rosenberg, M. (1986). Self-concept from middle child-hood through adolescence. In J. Suls & A. Greenwald (Eds.), *Psychological perspectives on the self* (Vol. 3, pp. 107–136). Hillsdale, NJ: Erlbaum.

Rosenberger, N. R. (1992). *Japanese sense of self.* New York: Cambridge University Press.

Ross, N., Medin, D., Coley, J. D., & Atran, S. (2003). Cultural and experiential differences in the development of folkbiological induction. *Cognitive Development, 18,* 25–47.

Rothbaum, F., Pott, M., & Azuma, H. (2000). The development of close relationships in Japan and the United States: Paths of symbolic harmony and generative tension. *Child Development, 71*(5), 1121–1142.

Rothbaum, F., Weisz, J., & Pott, M. (2000). Attachment and culture: Security in the United States and Japan. *American Psychologist, 55*(10), 1093–1104.

Rozin, P., & Nemeroff, C. (1990). The law of sympathetic magic. In J. Stigler, R. A. Shweder, & G. Herdt (Eds.), *Cultural psychology: Essays on comparative human development.* New York: Cambridge University Press.

Ruble, D. N., Alvarez, J., Bachman, M., Cameron, J., Fuligni, A., Garcia Coll, C., et al. (in press). The development of a sense of "we": The emergence and implications of children's collective identity. In M. Bennett & F. Sani (Eds.), *The development of the social self.* East Sussex, England: Psychology Press.

Russell, J. A. (1991). Culture and the categorization of emotions. *Psychological Bulletin, 110,* 426–450.

Ryff, C., Lee, Y., & Na, K. (1995). *Through the lens of culture: Psychological well-being at midlife.* Unpublished manuscript.

Sampson, E. E. (1985). The decentralization of identity: Toward a revised concept of personal and social order. *American Psychologist, 40,* 1203–1211.

Sampson, E. E. (1988). The debate on individualism: Indigenous psychologies of the individual and their role in personal and societal functioning. *American Psychologist, 43,* 15–22.

Sandel, T. L. (2003). Linguistic capital in Taiwan: The KMT's Mandarin language policy and its perceived impact on language practices of bilingual Mandarin and Tai-gi speakers. *Language in Society, 32,* 523–551.

Sass, L. A. (1992). The epic of disbelief: The postmodernist turn in contemporary psychoanalysis. In S. Kvale (Ed.), *Psychology and postmodernism* (pp. 166–182). London: Sage.

Sawyer, R. (1997). *Pretend play as improvisation: Conversation in the preschool classroom.* Mahwah, NJ: Erlbaum.

Schieffelin, B. B. (1990). *The give and take of everyday life: Language socialization of Kaluli children.* New York: Cambridge University Press.

Schieffelin, B. B., & Ochs, E. (1986a). Language socialization. In B. Siegel (Ed.), *Annual review of anthropology.* Palo Alto, CA: Annual Reviews.

Schieffelin, B. B., & Ochs, E. (Eds.). (1986b). *Language socialization across cultures.* New York: Cambridge University Press.

Schoneman, T. J. (1981). Reports of the sources of self-knowledge. *Journal of Personality, 49,* 284–294.

Schoultz, J., Säljö, R., & Wyndhamn, J. (2001). Heavenly talk: Discourse, artifacts, and children's understanding of elementary astronomy. *Human Development, 44,* 103–118.

Schwartz, T., White, G., & Lutz, C. (1992). *New directions in psychological anthropology.* New York: Cambridge University Press.

Schwartzman, H. (1978). *Tranformations: The anthropology of children's play.* New York: Plenum Press.

Scribner, S., & Cole, M. (1973). The cognitive consequences of formal and informal education. *Science, 182,* 553–559.

Scribner, S., & Cole, M. (1981). *The psychology of literacy.* Cambridge, MA: Harvard University Press.

Seymour, S. (1999). *Women, family and child care in India: A world in transition.* New York: Cambridge University Press.

Shimizu, H., & LeVine, R. (2001). *Japanese frames of mind: Cultural perspectives and human development.* New York: Cambridge University Press.

Shore, B. (1996). *Culture in mind: Cognition, culture and the problem of meaning.* New York: Oxford University Press.

Shuman, A. (1986). *Storytelling rights: The uses of oral and written texts by urban adolescents.* New York: Cambridge University Press.

Shwalb, D., & Shwalb, B. J. (1996). *Japanese childrearing: Two generations of scholarship.* New York: Guilford.

Shweder, R. A. (1982). Beyond self-constructed knowledge: The study of culture and morality. *Merrill-Palmer Quarterly, 28,* 41–69.

Shweder, R. A. (1990a). Cultural psychology: What is it. In J. W. Stigler, R. A. Shweder, & G. Herdt (Eds.), *Cultural psychology: Essays on comparative human development.* Cambridge, England: Cambridge University Press.

Shweder, R. A. (1990b). In defense of moral realism. *Child Development, 61,* 2060–2067.

Shweder, R. A. (1991). *Thinking through cultures: Expeditions in cultural psychology.* Cambridge, MA: Harvard University Press.

Shweder, R. A. (1992). Ghost busters in anthropology. In C. Strauss & R. G. D'Andrade (Eds.), *Human motives and cultural models.* New York: Cambridge University Press.

Shweder, R. A. (1996a). "The 'mind' of cultural psychology." In P. Baltes & U. Staudinger (Eds.), *Interactive minds: Life-span perspectives on the social foundations of cognition.* New York: Cambridge University Press.

Shweder, R. A. (1996b). True ethnography: The lore, the law and the lure. In R. Jessor, A. Colby, & R. A. Shweder (Eds.), *Ethnography and human development: Context and meaning in social inquiry.* Chicago: University of Chicago Press.

Shweder, R. A. (2003a). Toward a deep cultural psychology of shame. *Social Research, 70,* 1401–1422.

Shweder, R. A. (2003b). *Why do men barbecue? Recipes for cultural psychology.* Cambridge, MA: Harvard University Press.

Shweder, R. A. (2004). Deconstructing the emotions for the sake of comparative research. In A. S. R. Manstead, N. Frijda, & A. Fischer (Eds.), *Amsterdam Symposium: Feelings and emotions.* Cambridge, England: Cambridge University Press.

Shweder, R. A., Balle-Jensen, L., & Goldstein, W. (1995). Who sleeps by whom revisited: A method for extracting the moral goods implicit in praxis. In J. J. Goodnow, P. J. Miller, & F. Kessell (Eds.), *Cultural practices as contexts for development: New directions for child development.* San Francisco: Jossey-Bass.

Shweder, R. A., & Bourne, L. (1984). Does the concept of the person vary cross-culturally. In R. A. Shweder & R. A. LeVine (Eds.), *Culture theory: Essays on mind, self, and emotion* (pp. 158–199). New York: Cambridge University Press.

Shweder, R. A., & Haidt, J. (2000). The cultural psychology of the emotions: Ancient and new. In M. Lewis & J. Haviland (Eds.), *Handbook of Emotions.* NY: Guildford Press.

Shweder, R. A., & LeVine, R. A. (1984). *Culture theory: Essays on mind, self, and emotion.* New York: Cambridge University Press.

Shweder, R. A., Mahapatra, M., & Miller, J. G. (1990). Culture and moral development. In J. Stigler, R. A. Shweder, & G. Herdt (Eds.), *Cultural psychology: Essays on comparative human development.* New York: Cambridge University Press.

Shweder, R. A., Much, N. C., Mahapatra, M., & Park, L. (1997). The big three of morality (autonomy, community, divinity) and the big three explanations of suffering. In A. Brandt & P. Rozin (Eds.), *Morality and health.* New York: Routledge & Kegan Paul.

Shweder, R. A., & Sullivan, M. (1990). The semiotic subject of cultural psychology. In L. Pervin (Ed.), *Handbook of personality: Theory and research* (pp. 399–416). New York: Guilford Press.

Shweder, R. A., & Sullivan, M. (1993). Cultural psychology: Who needs it? *Annual Review of Psychology, 44,* 497–523.

Siegler, R. S., & Crowley, K. (1994). Constraints on learning in nonprivileged domains. *Cognitive Psychology, 27,* 194–226.

Snibbe, A. C., & Markus, H. R. (2004). *You can't always get what you want: Social class, agency and choice.* Unpublished manuscript.

Spence, D. P. (1982). *Narrative truth and historical truth: Meaning and interpretation in psychoanalysis.* New York: Norton.

Sperber, D. (2002). In defense of massive modularity. In E. Dupoux (Ed.), *Language, brain, and cognitive development* (pp. 47–57). Cambridge, MA: MIT Press.

Sperry, L. L., & Sperry, D. E. (1995). Young children's presentation of self in conversational narration. In L. L. Sperry & P. A. Smiley (Eds.), *Exploring young children's concepts of self and other through conversation: Vol. 69. New directions for child development.* San Francisco: Jossey-Bass.

Sperry, L. L., & Sperry, D. E. (1996). The early development of narrative skills. *Cognitive Development, 11,* 443–465.

Stavy, R., & Wax, N. (1989). Children's conceptions of plants as living things. *Human Development, 32,* 88–94.

Steedman, C. K. (1986). *Landscape for a good woman: A story of two lives.* New Brunswick, NJ: Rutgers University Press.

Stein, K., Markus, H., & Moeser, R. (1996). *The sociocultural shaping of self-esteem of American adolescent girls and boys.*

Stern, D. (1985). *The interpersonal world of the infant.* New York: Basic Books.

Stevenson, H. W. (1994). Moving away from stereotypes and preconceptions: Students and their education in East Asia and the United States. In P. M. G. R. R. Cocking (Ed.), *Cross-cultural roots of minority child development.* Hillsdale, NJ: Erlbaum.

Stevenson, H. W., & Stigler, J. W. (1992). *The learning gap: Why our schools are failing and what we can learn from Japanese and Chinese education.* New York: Summit Books.

Stigler, J. W., Shweder, R. A., & Herdt, G. (Eds.). (1990). *Cultural psychology: Essays on comparative human development* (pp. 259–286). Cambridge, England: Cambridge University Press.

Stigler, J. W., Smith, S., & Mao, L. (1985). The self-perception of competence by Chinese children. *Child Development, 56,* 1259–1270.

Strickland, B. R. (2000). Misassumptions, misadventures, and the misuse of psychology. *American Psychologist, 55,* 331–338.

Stromberg, P. G. (1993). *Language and self-transformation: A study of the Christian conversion narrative.* Cambridge: Cambridge University Press.

Sullivan, H. S. (1940). *Conceptions of modern psychiatry.* New York: Wiley.

Super, C., & Harkness, S. (1986). The developmental niche: A conceptualization at the interface of child and culture. *International Journal of Behavioral Development, 9,* 545–569.

Super, C., & Harkness, S. (1997). The cultural structuring of child development. In J. Berry, P. R. Dasen, & T. S. Saraswathi (Eds.), *Handbook of cross-cultural psychology* (Vol. 2, pp. 3–29). Boston: Allyn & Bacon.

Tajfel, H. (1981). *Human groups and social categories.* Cambridge, England: Cambridge University Press.

Takahashi, K., & Tokoro, M. (2002). Senior shutterbugs: Successful aging through participation in social activities. *International Society for Study of Behavioural Development Newsletter*(Serial No. 41, 9–11).

Taylor, C. (1989). *Sources of the self: The making of modern identities.* Cambridge, MA: Harvard University Press.

Taylor, C. E. (1995). "You think it was a fight?": Co-constructing (the struggle for) meaning, face, and family in everyday narrative activity. *Research on Language and Social Interaction, 28*(3), 283–317.

Taylor, M., & Carlson, S. M. (2000). The influence of religious beliefs on parental attitude about children's fantasy behavior. In K. S. Rosengren, C. N. Johnson, & P. L. Harris (Eds.), *Imagining the impossible* (pp. 247–268). New York: Cambridge University Press.

Tetlock, P. E., Kristel, O. V., Elson, S. E., Green, M. C., & Lerner, J. S. (2000). The psychology of the unthinkable: Taboo trade-offs, forbidden base rates, and heretical counterfactuals. *Journal of Personality and Social Psychology, 78,* 853–870.

Tetlock, P. E., McGraw, A. P., & Kristel, O. V. (2004). Proscribed forms of social cognition: Taboo tradeoffs, blocked exchanges, forbidden base rates, and heretical counterfactuals. In N. Haslam (Ed.), *Relational models theory: A contemporary overview* (pp. 247–262). Mahwah, NJ: Erlbaum.

Thoits, P. A., & Virshup, L. K. (1997). Me's and we's: Forms and functions of social identities. In R. D. Ashmore & L. J. Jussim (Eds.), *Rutger Series on self and social identity: Vol.1. Self and identity—Fundamental issues* (pp. 106–133). New York: Oxford University Press.

Thomas, D. (1978). Cooperation and competition among children in the Pacific Islands and New Zealand: The school as an agent of social change. *Journal of Research and Development in Education, 12,* 88–95.

Tobin, J. (2000). *Good guys don't wear hats.* New York: Teachers College Press.

Tobin, J. J., Wu, D. Y. H., & Davidson, D. H. (1989). *Preschool in three cultures: Japan, China, and the United States.* New Haven, CT: Yale University Press.

Tomasello, M. (1999). *The cultural origins of human cognition.* Cambridge, MA: Harvard University Press.

Tomasello, M., Kruger, A. C., & Ratner, H. H. (1993). Cultural learning. *Behavioral and Brain Sciences, 16,* 495–552.

Triandis, H. C. (1989). The self and social behavior in differing cultural contexts. *Psychological Review, 93*(3), 506–520.

Triandis, H. C. (1990). Cross-cultural studies of individualism and collectivism. In J. Berman (Ed.), *Nebraska Symposium on Motivation* (pp. 41–133). Lincoln: University of Nebraska Press.

Triandis, H. C., Bontempo, R., & Villareal, M. (1988). Individualism and collectivism: Cross-cultural perspectives on self-ingroup relationships. *Journal of Personality and Social Psychology, 54,* 323–338.

Tronick, E. Z., Morelli, G., & Ivey, P. K. (1992). The Efe forager infant and toddler's pattern of social relationships: Multiple and simultaneous. *Developmental Psychology, 28,* 568–577.

Tronick, E. Z., Morelli, G., & Winn, S. (1987). Multiple caretaking of Efe (Pygmy) infants. *American Anthropologist, 89,* 96–106.

Tsai, J. L., Simenova, D., & Watanabe, J. (1999). Somatic and social: Chinese Americans talk about emotion—Personality and Social Psychology Bulletin. In M. Tomasello (Ed.), *The cultural origins of human cognition.* Cambridge, MA: Harvard University Press.

Tu, W. (1994). Embodying the universe: A note on Confucian self-realization. In R. T. Ames, W. Dissanayake, & T. P. Kasulis (Eds.), *Self as person in Asian theory and practice* (pp. 177–186). Albany: State University of New York Press.

Valsiner, J. (1988). *Child development within culturally structured environments: Social co-construction and environmental guidance in development* (Vol. 2). Norwood, NJ: Ablex.

Valsiner, J. (1994). Co-construction: What is (and what is not) in a name. In P. van Geert & L. Mos (Eds.), *Annals of theoretical psychology* (Vol. 10, pp. 343–368). New York: Plenum Press.

Van der Meulen, M. (1986). Zelfconceptieproblemen bij jonge kinderen: Een analyse van spontane, zelfbeschouwende uitspraken. *Nederlands Tijdschrift voor de Psychologie en haar Grensgebieden, 41*(6), 261–267.

Van Deusen-Phillips, S. B., Goldin-Meadow, S., & Miller, P. J. (2001). Enacting stories, seeing worlds: Similarities and differences in the cross-cultural narrative development of linguistically isolated deaf children. *Human Development, 44,* 311–336.

Varela, F. J., Thompson, E., & Rosch, E. (1993). *The embodied mind: Cognitive science and human experience.* Cambridge, MA: MIT Press.

Vinden, P. G. (1996). Junin Quechua children's understanding of mind. *Child Development, 67,* 1701–1716.

Vinden, P. G., & Astington, J. W. (2000). Culture and understanding other minds. In S. Baron-Cohen, H. Tager-Flusberg, & D. J. Cohen (Eds.), *Understanding other minds: Perspectives from developmental cognitive neuroscience* (pp. 504–519). Oxford, England: Oxford University Press.

Vygotsky, L. S. (1987). *The collected works of L. S. Vygotsky: Vol. 1. Problems of general psychology.* New York: Plenum Press. (Original work published 1934)

Walkerdine, V. (1988). *The mastery of reason.* London: Routledge & Kegan Paul.

Wang, Q. (2001a). Culture effects on adults' earliest childhood recollection and self-description: Implications for the relation between memory and the self. *Journal of Personality and Social Psychology, 81*(2), 220–233.

Wang, Q. (2001b). "Did you have fun?": American and Chinese mother-child conversations about shared emotional experiences. *Cognitive Development, 16,* 693–715.

Wang, Q., & Leichtman, M. D. (2000). Same beginnings, different stories: A comparison of American and Chinese children's narratives. *Child Development, 71*(5), 1329–1346.

Wang, Q., Leichtman, M. D., & Davies, K. I. (2000). Sharing memories and telling stories: American and Chinese mothers and their 3-year-olds. *Memory, 8*(3), 159–178.

Watson-Gegeo, K. A. (1993). Thick explanation in the ethnographic study of child socialization: A longitudinal study of the problem of schooling for Kwara'ae (Solomon Island) children. In W. A. Corsaro & P. J. Miller (Eds.), *Interpretive approaches to childhood socialization* (pp. 51–66). San Francisco: Jossey-Bass.

Watson-Gegeo, K. A., & Gegeo, D. W. (1990). Shaping the mind and straightening out conflicts: The discourse of Kwara'ae family counseling. In K. A. Watson-Gegeo & G. M. White (Eds.), *Disentangling: Conflict discourse in Pacific societies* (pp. 161–213). Stanford, CA: Stanford University Press.

Watson-Gegeo, K., & Gegeo, D. W. (1999). Remodeling culture in Kwara'ae: The role of discourse in children's cognitive development. *Discourse Studies, 1*(2), 227–245.

Weigert, A. J., Teitge, J. S., & Teitge, D. W. (1990). *Society and identity: Towards a sociological psychology.* New York: Cambridge University Press.

Weisner, T. S. (1982). Sibling interdependence and sibling caretaking: A cross-cultural view. In M. Lamb & B. Sutton-Smith (Eds.), *Sibling relationships: Their nature and significance across the lifespan.* Hillsdale, NJ: Erlbaum.

Weisner, T. S. (1984). A cross-cultural perspective: Ecological niches of middle childhood. In A. Collins (Ed.), *The elementary school years: Understanding development during middle childhood* (pp. 335–369). Washington, DC: National Academy.

Weisner, T. S. (1987). Socialization for parenthood in sibling caretaking societies. In J. Lancaster, A. Rossi, & J. Altmann (Eds.), *Parenting across the lifespan.* New York: Aldine.

Weisner, T. S. (1989a). Comparing sibling relationships across cultures. In P. Zukow (Ed.), *Sibling interaction across cultures.* New York: Springer-Verlag.

Weisner, T. S. (1989b). Cultural and universal aspects of social support for children: Evidence from the Alaluyia of Kenya. In D. Belle (Ed.), *Children's social networks and social supports.* New York: Wiley.

Weisner, T. S. (1996a). The 5–7 transition as an ecocultural project. In A. Sameroff & M. Haith (Eds.), *Reason and responsibility: The passage through childhood.* Chicago: University of Chicago Press.

Weisner, T. S. (1996b). Why ethnography should be the most important method in the study of human development. In R. Jesser, A. Colby, & R. A. Shweder (Eds.), *Ethnography and human development.* Chicago: University of Chicago Press.

Weisner, T. S. (2001). Anthropological aspects of childhood. In *International encyclopedia of the social and behavioral sciences* (Vol. 3, pp. 1697–1701). Oxford, England: Elsevier.

Weisner, T. S. (2002). Ecocultural understanding of children's developmental pathways. *Human Development, 45,* 275–281.

Weisner, T. S., Bausano, M., & Kornfein, M. (1983). Putting family ideals into practice. *Ethos, 11,* 278–304.

Weisner, T. S., & Gallimore, R. (1977). My brother's keeper: Child and sibling caretaking. *Current Anthropology, 18,* 169–180.

Weisner, T. S., & Lowe, E. D. (in press). Globalization, childhood, and psychological anthropology. In C. Casey & R. Edgerton (Eds.), *A companion to psychological anthropology: Modernity and psychocultural change.* Oxford, England: Blackwell.

Wellman, H. M., Cross, D., & Watson, J. (2001). Meta-analysis of theory-of-mind development: The truth about false belief. *Child Development, 72,* 655–684.

Wellman, H. M., & Gelman, S. A. (1998). Knowledge acquisition in foundational domains. In W. Damon (Editor-in-Chief) & D. Kuhn & R. S. Siegler (Vol. Eds.), *Handbook of child psychology: Vol. 2. Cognition, perception and language* (5th ed., pp. 523–573). New York: Wiley.

Wenger, M. (1989). Work, play and social relationships among children in a Giriama community. In D. Belle (Ed.), *Children's social networks and social supports.* New York: Wiley.

Werker, J. (1989). Becoming a native listener. *American Scientist, 77,* 54–59.

Wertsch, J. V. (1985). *Vygotsky and the social formation of mind.* Cambridge, MA: Harvard University Press.

Wertsch, J. V. (1991). *Voices of the mind.* Cambridge, MA: Harvard University Press.

Wertsch, J. V. (1992). Keys to cultural psychology. *Culture, Medicine and Psychiatry, 16*(3), 273–280.

White, G. M., & Kirkpatrick, J. (1985). *Person, self and experience: Exploring Pacific ethnopsychologies.* Berkeley: University of California Press.

White, M. I., & LeVine, R. A. (1986). What is an li ko (good child)? In H. Stevenson, H. Azuma, & K. Hakuta (Eds.), *Child development and education in Japan* (pp. 55–62). New York: Freeman.

Whiting, B. B., & Edwards, C. P. (1988). *Children of different worlds.* Cambridge, MA: Harvard University Press.

Whiting, B. B., & Whiting, J. W. M. (1975). *Children of six cultures.* Cambridge, MA: Harvard University Press.

Whiting, J. W. M. (1941). *Becoming a Kwoma.* New Haven, CT: Yale University Press.

Whiting, J. W. M. (1964). Effects of climate on certain cultural practices. In W. H. Goodenough (Ed.), *Explorations in cultural anthropology.* New York: McGraw-Hill.

Whiting, J. W. M. (1981). Environmental constraints on infant care practices. In R. H. Munroe, R. L. Munroe, & B. B. Whiting (Eds.), *Handbook of cross-cultural human development.* New York: Garland.

Whiting, J. W. M., & Child, I. (1953). *Child training and personality.* New Haven, CT: Yale University Press.

Wierzbicka, A. (1986). Human emotions: Universal or culture-specific? *American Anthropologist, 88*(3), 584–594.

Wierzbicka, A. (1990). Semantics of the Emotions [Special issue]. *Australian Journal of Linguistics, 10*(2).

Wierzbicka, A. (1991). *Cross-cultural pragmatics: The semantics of human interaction.* Berlin, Germany: W. de Gruyter.

Wierzbicka, A. (1992). *Semantics, culture and cognition: Universal human concepts in culture-specific configurations.* New York: Oxford University Press.

Wierzbicka, A. (1993). A conceptual basis for cultural psychology. *Ethos, 21*(2), 205–231.

Wierzbicka, A. (1999). *Emotions across languages and cultures: Diversity and universals.* Paris: Cambridge University Press.

Wiley, A. R., Rose, A. J., Burger, L. K., & Miller, P. J. (1998). The construction of autonomy through narrative practices: A comparative study. *Child Development, 69,* 833–847.

Willis, P. (1977). *Learning to labor: How working class kids get working class jobs.* New York: Columbia University Press.

Wolf, S. A., & Heath, S. B. (1992). *The braid of literature: Children's worlds of reading.* Cambridge, MA: Harvard University Press.

Wortham, S. (2001). *Narratives in action: A strategy for research and analysis.* New York: Teachers College Press.

Wu, D. Y. H. (1994). Self and collectivity: Socialization in Chinese preschools. In R. T. Ames, W. Dissanayake, & T. P. Kasulis (Eds.), *Self as person in Asian theory and practice.* Albany: State University of New York Press.

Wu, D. Y. H. (1996). Chinese childhood socialization. In M. H. Bond (Ed.), *The handbook of Chinese psychology* (pp. 143–154). Hong Kong, China: Oxford University Press.

Yang, K.-S. (1997). Indiginizing westernized Chinese psychology. In M. H. Bond (Ed.), *Working at the interface of culture: 18 lives in social science.* London: Routledge & Kegan Paul.

Yip, T., & Fuligni, A. J. (in press). Daily variation in ethnic identity, ethnic behaviors, and psychological well being among American adolescents of Chinese descent. *Child Development.*

Youniss, J., & Yates, M. (1997). *Community service and social responsibility in youth.* Chicago: The University of Chicago Press.

CHAPTER 14

The Bioecological Model of Human Development

URIE BRONFENBRENNER and PAMELA A. MORRIS

OVERVIEW 795
DEFINING PROPERTIES OF THE BIOECOLOGICAL MODEL 796
Proposition I 797
Proposition II 798
FROM THEORY TO RESEARCH DESIGN: OPERATIONALIZING THE BIOECOLOGICAL MODEL 799
Developmental Science in the Discovery Mode 801
Different Paths to Different Outcomes: Dysfunction versus Competence 803
The Role of Experiments in the Bioecological Model 808
HOW DO PERSON CHARACTERISTICS INFLUENCE LATER DEVELOPMENT? 810
Force Characteristics as Shapers of Development 810
Resource Characteristics of the Person as Shapers of Development 812
Demand Characteristics of the Person as Developmental Influences 812
THE ROLE OF FOCUS OF ATTENTION IN PROXIMAL PROCESSES 813
PROXIMAL PROCESSES IN SOLO ACTIVITIES WITH OBJECTS AND SYMBOLS 814
THE MICROSYSTEM MAGNIFIED: ACTIVITIES, RELATIONSHIPS, AND ROLES 814
Effects of the Physical Environment on Psychological Development 814
The Mother-Infant Dyad as a Context of Development 815
BEYOND THE MICROSYSTEM 817
The Expanding Ecological Universe 818
Nature-Nurture Reconceptualized: A Bioecological Interpretation 819
TIME IN THE BIOECOLOGICAL MODEL: MICRO-, MESO-, AND MACROCHRONOLOGICAL SYSTEMS 820
FROM RESEARCH TO REALITY 822
THE BIOECOLOGICAL MODEL: A DEVELOPMENTAL ASSESSMENT 824
REFERENCES 825

The bioecological model, together with its corresponding research designs, is an evolving theoretical system for the scientific study of human development over time (Bronfenbrenner, 2005). In the bioecological model, development is defined as the phenomenon of continuity and change in the biopsychological characteristics of human beings, both as individuals and as groups. The phenomenon extends over the life course, across successive generations, and through historical time, both past and future. The term *future* raises a question: How is it possible to scientifically investigate phenomena that have not yet taken place? This question is hardly new; indeed, it pervades every field of scientific endeavor. However, we are the only species that, over historical time, has developed the capacity to engage successfully in scientific inquiry, and thereby, in many respects, has

We are especially grateful for the thoughtful criticisms of earlier drafts of the manuscript generously provided by the following colleagues: Jay Belsky, Rick Canfield, Nancy Darling, Glen H. Elder Jr., Steven F. Hamilton, Melvin L. Kohn, Kurt Lüscher, Phyllis Moen, Donna Dempster-McLain, Laurence Steinberg, and Sheldon H. White. We owe particular thanks to Professor Susan Crockenberg and her students at the University of Vermont who, in the course of a graduate seminar, carefully reviewed a draft of this chapter, and made many constructive suggestions. We have done our best to meet the high standards that they commendably set. We wish to express gratitude to Richard M. Lerner and William Damon, the editors of the 1998 Volume and of that series as a whole, for their wise advice, encouragement, and patience. Finally, a special thanks goes to our most severe and most constructive critic, Liese Bronfenbrenner.

been able to change the nature of the world in which we live. As a result, within certain limits, we humans have altered the nature and course of our own development as a species (Bronfenbrenner & Evans 2000; Bronfenbrenner & Morris 1998).

To place bioecological theory of human development into a larger context, it is important to recognize that many of the general perspectives advanced and elaborated in this theory are also parts of other related lines of theoretical and empirical inquiry into human development. Examples include life-span psychology (Baltes, Lindenberger, & Staudinger, Chapter 11, this *Handbook,* this volume), cultural psychology (Cole, 1995; Shweder et al., Chapter 13, this *Handbook,* this volume), Magnusson's developmental theory of contextual-interactive holism (Magnusson & Stattin, Chapter 8, this *Handbook,* this volume), and, especially, the work of Robert Cairns (Chapter 3, this *Handbook,* this volume), who through communications and publications extending over 3 decades, has played a major role in the evolution of the four defining properties of the bioecological model: (1) Process, (2) Person, (3) Context, and (4) Time. Cairns is best known as the founder and principal protagonist of developmental science, and there are several excellent examples of his books and articles that have been most relevant to the evolution of the bioecological model (Bergman, Cairns, Nilsson, & Nysted, 2000; Cairns, 1970; Cairns & Cairns, 1994). The specific profile of the bioecological model of human development is its interdisciplinary and integrative focus on the age periods of childhood and adolescence and its explicit interest in applications to policies and programs pertinent to enhancing youth and family development.

In this chapter, we undertake to present the ecological model of human development that has been introduced over the course of the prior two editions of this *Handbook* (Bronfenbrenner & Crouter, 1983; Bronfenbrenner & Morris, 1998). The main focus of the 1983 chapter was on the empirical and theoretical roots of a model already in use, which centered on the role of the environment in shaping development. In contrast, this chapter is oriented toward the future. The present model introduces major theoretical innovations from the 1983 chapter in both form and content. The present formulation makes no claim as a paradigm shift (if there be such a phenomenon); rather, it continues a marked shift in the center of gravity of the model, in which features of earlier versions are first called into question but then recombined, along with new elements, into a more complex and more dynamic structure.

The transition in the form and content of the model actually took place over an extended period of time, an expression that will become all too familiar to the reader (Bronfenbrenner, 2005). The transition from a focus on the environment to a focus on processes was first introduced in the context of Bronfenbrenner's unpublished lectures, colloquium presentations, and contributions to symposia. Not until 1986, did reference to an emergent new model first appear in print (Bronfenbrenner, 1986b). The following extended excerpt conveys both its spirit and intended substance. Because both of these attributes are relevant to the gradual evolution of the model to its present form, we quote from the 1986 statement at some length:

> It is now more than a decade ago that, being somewhat younger, I presumed to challenge the then-prevailing conventions of our field by describing the developmental research of the day as "the study of the strange behavior of children in strange situations for the briefest possible period of time" (Bronfenbrenner, 1974). Instead, I argued (as if it were simply a matter of choice), we should be studying development in its ecological context; that is, in the actual environments in which human beings lived their lives. I then proceeded to outline, in a series of publications, a conceptual framework for analyzing development in context, and to offer concrete examples of how various elements of the schema might be applied both to past studies and to studies yet-to-come. I also emphasized the scientific and practical benefits of a closer linkage, in both directions, between developmental research and public policy (Bronfenbrenner, 1974, 1975, 1977a, 1977b, 1979a, 1979b, 1981). Now, a dozen years later, one might think that I have good reason to rest content. Studies of children and adults in real-life settings, with real-life implications, are now commonplace in the research literature on human development, both in the United States and, as this volume testifies, in Europe as well. This scientific development is taking place, I believe, not so much because of my writings, but rather because the notions I have been promulgating are ideas whose time has come. . . .
>
> Clearly, if one regards such scientific developments as desirable, there are grounds for satisfaction. Yet, along with feelings of gratification, I must confess to some discontent. My disquiet derives from two complementary concerns. The first pertains to one of the main roads that contemporary research has taken; the second, to some more promising pathways that are being neglected.

> Alas, I may have to accept some responsibility for what I regard as the wayward course. It is an instance of what might be called "the failure of success." For some years, I harangued my colleagues for avoiding the study of development in real-life settings. No longer able to complain on that score, I have found a new *bête noir.* In place of too much research on development "out of context," we now have a surfeit of studies on "context without development."
>
> One cannot presume to make so brass an allegation without being prepared to document one's case. I am prepared. (Bronfenbrenner 1986a, pp. 286–288)

What followed was an early version of the newly evolving theoretical framework, but the purpose of the present chapter is better served by presenting the model in its current, albeit still-evolving, form now called the *bioecological model.* The term *evolving* highlights that the model, along with its corresponding research designs, has undergone a process of development during its life course (Bronfenbrenner, 2005). The bioecological model addresses two closely related but fundamentally different developmental processes, each taking place over time. The first process defines the phenomenon under investigation—continuity and change in the biopsychological characteristics of human beings. The second focuses on the development of the scientific tools—theoretical models and corresponding research designs required for assessing continuity and change.

These two tasks cannot be carried out independently, for they are the joint product of emerging and converging ideas, based on both theoretical and empirical grounds—a process called *developmental science* in the discovery mode (Bronfenbrenner & Evans 2000, pp. 999–1000). In the more familiar verification mode, the aim is to replicate previous findings in other settings to make sure that the findings still apply. By contrast, in the discovery mode, the aim is to fulfill two broader but interrelated objectives:

1. Devising new alternative hypotheses and corresponding research designs that not only question existing results but also yield new, more differentiated, more precise, replicable research findings and, thereby, produce more valid scientific knowledge.
2. Providing scientific bases for the design of effective social policies and programs that counteract newly emerging developmentally disruptive influences. This has been an explicit objective of the bioecological model from its earliest beginnings. To orient the reader to the present formulation of the biological model, a preview follows.

OVERVIEW

We begin with an exposition of the defining properties of the model, which involves four principal components and the dynamic, interactive relationships among them. The first of these, which constitutes the core of the model, is *Process.* More specifically, this construct encompasses particular forms of interaction between organism and environment, called *proximal processes,* that operate over time and are posited as the primary mechanisms producing human development. However, the power of such processes to influence development is presumed, and shown, to vary substantially as a function of the characteristics of the developing *Person,* of the immediate and more remote environmental *Contexts,* and the *Time* periods, in which the proximal processes take place.

The sections that follow examine in greater detail each of the three remaining defining properties of the model, beginning with the biopsychological characteristics of the Person. This domain was given sequential priority to fill a recognized gap in earlier prototypes of the ecological model. Thus, at midstage in the development of the present model, Bronfenbrenner criticized its theoretical predecessors and acknowledged his share of responsibility for failing to deliver on an empirical promise:

> Existing developmental studies subscribing to an ecological model have provided far more knowledge about the nature of developmentally relevant environments, near and far, than about the characteristics of developing individuals, then and now. . . . The criticism I just made also applies to my own writings. . . . Nowhere in the 1979 monograph, nor elsewhere until today, does one find a parallel set of structures for conceptualizing the characteristics of the developing person. (Bronfenbrenner, 1989a, p. 188)

Three types of Person characteristics are distinguished as most influential in shaping the course of future development through their capacity to affect the direction and power of proximal processes through the life course. First, *dispositions* can set proximal processes in motion in a particular developmental domain and continue to sustain their operation. Next,

bioecological *resources* of ability, experience, knowledge, and skill are required for the effective functioning of proximal processes at a given stage of development. Finally, *demand* characteristics invite or discourage reactions from the social environment that can foster or disrupt the operation of proximal processes. The differentiation of these three forms leads to their combination in patterns of Person structure that can further account for differences in the direction and power of resultant proximal processes and their developmental effects.

These new formulations of qualities of the person that shape his or her future development have had the unanticipated effect of further differentiating, expanding, and integrating the original 1979 conceptualization of the environment in terms of nested systems ranging from *micro* to *macro* (Bronfenbrenner, 1979b). For example, the three types of Person characteristics previously outlined are also incorporated into the definition of the *microsystem* as characteristics of parents, relatives, close friends, teachers, mentors, coworkers, spouses, or others who participate in the life of the developing person on a fairly regular basis over extended periods of time.

The bioecological model also introduces an even more consequential domain into the structure of the microsystem that emphasizes the distinctive contribution to development of proximal processes involving interaction not with people but with objects and symbols. Even more broadly, concepts and criteria are introduced that differentiate between those features of the environment that foster versus interfere with the development of proximal processes. Particularly significant in the latter sphere is the growing hecticness, instability, and chaos in the principal settings in which human competence and character are shaped—in the family, child-care arrangements, schools, peer groups, and neighborhoods.

The latter theme speaks to the fourth and final defining property of the bioecological model and the one that moves it farthest beyond its predecessor—the dimension of *Time*. The 1979 Volume scarcely mentions the term, whereas in the current formulation, it has a prominent place at three successive levels: (1) micro-, (2) meso-, and (3) macro-. *Microtime* refers to continuity versus discontinuity in ongoing episodes of proximal process. *Mesotime* is the periodicity of theses episodes across broader time intervals, such as days and weeks. Finally, *Macrotime* focuses on the changing expectations and events in the larger society, both within and across generations, as they affect and are affected by, processes and outcomes of human development over the life course. The treatment of this last topic draws on Elder and Shanahan, Chapter 12, this *Handbook,* this volume. Our primary emphasis, however, is on the role of developmental processes and outcomes in producing large-scale changes over time in the state and structure of the broader society over time, and the implications of those changes for the society's future.

Before turning to the task at hand, it is important to make explicit three overarching orientations that define the content and the structure of the chapter as a whole. First, we use the term *development* to refer to *stability and change in the biopsychological characteristics of human beings over the life course and across generations.* There are no restrictive assumptions of change for the better or of continuity in the characteristics of the same person over time. Rather, these are issues to be investigated.

Second, from the perspective of the bioecological model, the forces producing stability and change in the characteristics of human beings *across* successive generations are no less important than stability and change *in* the characteristics of the same person over his or her lifetime.

The third orientation is perhaps the most essential, and the most difficult to achieve. It was Kurt Lewin (cited in Marrow, 1977) who said that there is nothing so practical as a good theory. But to be "good," a theory must also be "practical." In science, a good theory is one that can be translated into corresponding research designs that match the defining properties of the theory. In the absence of such research designs—or worse yet, in the application of research designs that fail to match or even violate the defining properties of the theory—science cannot move forward. Hence, we have sought, as we proceed through successive stages of theoretical formulation, to specify, and, wherever possible, to illustrate the properties of a research design that corresponds with, or at least approximates, the proposed theoretical structure.

DEFINING PROPERTIES OF THE BIOECOLOGICAL MODEL

An early critical element in the definition of the bioecological model is *experience,* which indicates that the scientifically relevant features of an environment for human development not only include its objective prop-

erties but also the way in which the properties are subjectively experienced by the person living in that environment. This equal emphasis on an *experiential* as well as an *objective* view springs neither from an antipathy to behaviorist concept nor from a predilection for existential philosophic foundations but is dictated simply by the fact that very few of the external influences significantly affecting human behavior and development can be described solely in objective physical conditions and events (Bronfenbrenner & Evans 2000; Bronfenbrenner & Morris 1998).

Critical to the foregoing formulation is the word *solely.* In the bioecological model, both objective and subjective elements are posited as driving the course of human development; neither alone is presumed sufficient. Moreover, these elements do not always operate in the same direction. It is therefore important to understand the nature of each of these two dynamic forces, beginning on the phenomenological or experiential side. Both of the terms are relevant because, while related to each other, they are typically applied to somewhat different spheres. Experiential is more often used in relation to cognitive development and pertains mainly to changes in how the environment is perceived at successive stages of the life course, beginning in early infancy and proceeding through childhood, adolescence, adulthood, and, ultimately, old age.

By contrast, *experience* pertains more to the realm of feelings—anticipations, forebodings, hopes, doubts, or personal beliefs. Feelings, emerging in early childhood and continuing through life, are characterized by both stability and change: They can relate to self or to others, especially to family, friends, and other close associates. They can also apply to the activities in which we engage; for example, those that we most or least like to do. But the most distinctive feature of such experiential equalities is that they are emotionally and motivationally loaded, encompassing both love and hate, joy and sorrow, curiosity and boredom, desire and revulsion, often with both polarities existing at the same time but usually in differing degrees. A significant body of research evidence indicates that such positive and negative subjective forces, evolving in the past, can also contribute in powerful ways to shaping the course of development in the future (Bronfenbrenner & Evans 2000; Bronfenbrenner & Morris 1998).

But these forces are not the only powerful ones at work, other forces are more objective in nature. This presence does not mean, however, that the forces are necessarily either more or less influential, mainly because the two sets of forces are interdependent and affect each other. Like their subjective counterparts, these more objective factors also rely on their assessment of corresponding theoretical models and associated research designs, which evolved over time. These more objective relationships are documented propositions presented later (see too Bronfenbrenner & Evans 2000; Bronfenbrenner & Morris 1998). The first proposition specifies the theoretical model, and provides concrete examples; the second foreshadows a corresponding research design for their assessment.

However, before proceeding with formal definitions, it may be useful to point out that traditionally such phenomena as parent-child interaction—or, more generally, the behavior of others toward the developing person—have been treated under the more inclusive category of the environment. In the *bioecological model,* a critical distinction is made between the concepts of *environment* and *process,* with the latter not only occupying a central position, but also having a meaning that is quite specific. The construct appears in Proposition I stipulating the defining properties of the model. To place its meaning in context, we cite Proposition II as well.

Proposition I

> Especially in its early phases, but also throughout the life course, human development takes place through processes of progressively more complex reciprocal interaction between an active, evolving biopsychological human organism and the persons, objects, and symbols in its immediate external environment. To be effective, the interaction must occur on a fairly regular basis over extended periods of time. Such enduring forms of interaction in the immediate environment are referred to as proximal processes. Examples of enduring patterns of proximal process are found in feeding or comforting a baby, playing with a young child, child-child activities, group or solitary play, reading, learning new skills, athletic activities, problem solving, caring for others in distress, making plans, performing complex tasks, and acquiring new knowledge and know-how.

For the younger generation, participation in such interactive processes over time generates the ability, motivation, knowledge, and skill to engage in such activities both with others and on your own. For example, through progressively more complex interaction with their parents, children increasingly become agents of their own development, to be sure only in part.

Proximal processes are posited as the primary engines of development (see Gottlieb, Wahlsten, & Lickliter, Chapter 5, this *Handbook,* this volume; Tobach, 1981; Tobach & Schneirla, 1968). A second defining property, the fourfold source of these dynamic forces is identified in Proposition II.

Proposition II

> The form, power, content, and direction of the proximal processes effecting development vary systematically as a joint function of the characteristics of the developing person, the environment—both immediate and more remote—in which the processes are taking place, the nature of the developmental outcomes under consideration, and the social continuities and changes occurring over time through the life course and the historical period during which the person has lived.

Propositions I and II are theoretically interdependent and subject to empirical test. An operational research design that permits their simultaneous investigation is referred to as the *Process-Person-Context-Time (PPCT) model.*

Characteristics of the person actually appear twice in the bioecological model—first as one of the four elements influencing the *form, power, content, and direction of the proximal process,* and then again as *developmental outcomes*—qualities of the developing person that emerge at a later point in time as the result of the joint, interactive, mutually reinforcing effects of the four principal antecedent components of the model. In sum, in the bioecological model, the characteristics of the person function both as an indirect producer and as a product of development (see Lerner, 1982, 2002; Lerner & Busch-Rossnagel, 1981).

Finally, because in the bioecological model the concept of proximal process has a specific meaning, it is important that its distinctive properties be made explicit. For present purposes, the following features of the construct are especially noteworthy:

1. For development to occur, the person must engage in an activity.
2. To be effective, the activity must take place "on a fairly regular basis, over an extended period of time." For example, this means that with young children, a weekend of doing things with Mom or Dad does not do the job, nor do activities that are often interrupted.
3. Why not? One reason is that, to be developmentally effective, activities must continue long enough to become "increasingly more complex." Mere repetition does not work.
4. Developmentally effective proximal processes are not unidirectional; there must be influence in both directions. For interpersonal interaction, this means that initiatives do not come from one side only; there must be some degree of reciprocity in the exchange.
5. Proximal processes are not limited to interactions with people; they also can involve interaction with objects and symbols. In the latter circumstance, for reciprocal interaction to occur, the objects and symbols in the immediate environment must be of a kind that invites attention, exploration, manipulation, elaboration, and imagination.
6. The powerful moderating factors specified in Proposition II produce substantial changes in the content, timing, and effectiveness of proximal processes. In particular:
   a. As children grow older, their developmental capacities increase both in level and range; therefore, to continue to be effective, the corresponding proximal processes must also become more extensive and complex to provide for the future realization of evolving potentials. At the same time, in view of the ongoing developmental advance, the intervals between periods of "progressively more complex" activity can be increasingly longer, although they must still occur on a "fairly regular basis." Otherwise, the pace of development slows, or its course may even reverse direction.
   b. The principal persons with whom young children interact "on a fairly regular basis over extended periods of time" are parents, but especially as children get older, other persons—such as caregivers, relatives, siblings, and peers—also function in this role. These are soon followed by teachers or mentors in other activities, and then by close friends of the same or opposite sex, spouses or their equivalents, and coworkers, superiors and subordinates at work. As the examples indicate, the involvement of persons functioning

in this role is not limited to the formative years. Borrowing a term from G. H. Mead (1934), we refer to such persons as *significant others.*

The foregoing constitute the principal elements of the emergent theoretical model. If so, the question arises in what sense is the model *bio*ecological? Where and how does biology come into the picture? We present three answers to that question in an order of decreasing certainty about their validity. The first is an unqualified disclaimer. Little in the pages that follow speaks to the operation of biological systems *within* the organism. By contrast, considerable scientific attention is accorded to characteristics of the person generally regarded as *biologically based* that influence proximal processes and their developmental outcomes. Finally, the present model rests on the assumption that biological factors and evolutionary processes not only set limits on human development but also impose imperatives regarding the environmental conditions and experiences required for the realization of human potentials. The position is taken that, to the extent that the necessary conditions and experiences are not provided, such potentials will remain unactualized (Bronfenbrenner & Ceci, 1993, 1994a, 1994b).

It is our belief that, when applied, the bioecological paradigm is scientifically productive. At the present time, however, its most distinguishing characteristic is not its proven scientific power, but its rarity. To be sure, the rarity is hardly surprising, given the fact that successive revisions of the emerging model began to be published only in the past several years (Bronfenbrenner, 1989a, 1990, 1993, 1994, 1995; Bronfenbrenner & Morris, 1998; Bronfenbrenner & Ceci, 1994a). Paradoxically, some concrete examples nevertheless existed much earlier. They were the product of what Bronfenbrenner and Crouter referred to in the 1983 edition of this *Handbook* as "latent paradigms"; that is, theoretical models that were not explicitly stated, but were implicit in the research designs used in analyzing the data (Bronfenbrenner & Crouter, 1983, pp. 373–376). Indeed, a partial precursor of the bioecological model appeared in the 1983 *Handbook* chapter under the rubric of a "person-process-context model." In that chapter, however, what is meant by process is never specified, and the overwhelming majority of the examples cited do not include a proximal process component as defined in Proposition I. The same holds true for developmentally relevant characteristics of the Person. The 1983 chapter also made no reference to Time as a defining property of the theoretical model. In these and other respects to follow, today's bioecological model goes far beyond its predecessors both with respect to basic constructs and their bidirectional, synergistic interrelationships.

FROM THEORY TO RESEARCH DESIGN: OPERATIONALIZING THE BIOECOLOGICAL MODEL

We have come to the point where it is both possible and necessary to examine the requirements imposed by the bioecological model for corresponding research designs. We begin with a concrete example of the latter.

In the 1950s and 1960s, Cecil Mary Drillien (1957, 1964), a physician and professor of child life and health at the University of Edinburgh, carried out a 7-year longitudinal investigation of psychological development in two groups: 360 children of low birthweight and a control group selected "by taking the next mature birth from the hospital admission list" (1957, p. 29). In her follow-up assessments, the investigator found that children of low birthweight were more likely to exhibit problems in physical growth, susceptibility to illness, impaired intellectual development, and poorer classroom performance, with all of these tendencies being more pronounced in boys (1964). In a comparison of children's school performance with what would have been expected on the basis of their scores on an intelligence test, Drillien found that those of low birthweight were especially likely to be working below their mental capacity. In relation to this finding, the author comments as follows: "In most cases, failure to attain a standard commensurate with ability was associated with problems of behavior, which were found to increase with decreasing birthweight [and] to be more common in males" (1964, p. 209).

Figure 14.1 depicts the results. The figure does not appear in Drillien's monograph, but was constructed from data presented in tables in that volume. It shows the impact of the quality of mother-infant interaction at age 2 on the number of observed problem behaviors at age 4 as a joint function of social class and three levels of low birthweight—those underweight by a pound or more, not more than one pound, and those of normal birthweight. Measures of maternal responsiveness were based on

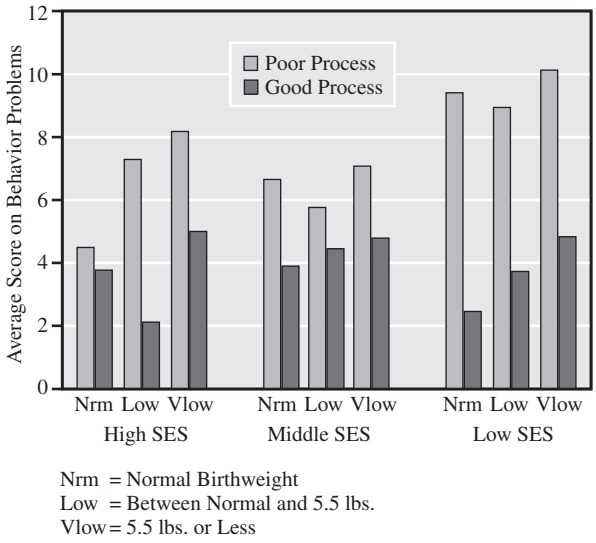


Figure 14.1 Effect of mother's responsiveness on problem behavior of child at age 4 by birthweight and social class.

observations in the home and interviews with the mother. The investigator's measure of social class was a composite index that took into account not only parental income and education but also the socioeconomic level of the neighborhood in which the family lived. The quality of interaction was assessed by extent to which the mother was responsive to changes in the state and behavior of the infant. The measure of the developmental outcome was the frequency of reported behavior disturbances such as hyperactivity, overdependence, timidity, and negativism.

Our primary interest is not in the research findings, but in the extent to which the structure of the research design corresponds with the defining properties of the bioecological theoretical model. The first point to be noted in this regard is that Proposition I defines Proximal Processes as bidirectional. Drillien's measure of process, however, was based only on the mother's responsiveness to changes in the state and behavior of the infant, and no data are reported that would permit calculating a complementary measure of the infant's responsiveness to changes in the state and behavior of the mother. This means that the operational measure available in Drillien's research taps only one side of the theoretical definition of proximal process. For that reason, it appears likely that, to the extent the infant's contribution to reciprocal interaction carries any weight, the obtained results may underestimate the true magnitude of the observed effects.

Nevertheless, as revealed in Figure 14.1, maternal responsiveness across time, a one-sided measure of proximal process, still emerges as the most powerful predictor of developmental outcome. In all instances, responsive maternal treatment reduces substantially the degree of behavioral disturbance exhibited by the child.

Herein lies the main justification for distinguishing between proximal process on the one hand, and, on the other, the environments in which the processes occur; namely, in accord with Proposition I, proximal processes turn out to be the most potent force influencing the developmental outcome (in this case, the frequency of problem behaviors at 4 years of age). Furthermore, as stipulated in Proposition II, the power of the Process varies systematically as a function of the environmental Context (i.e., social class) and of the characteristics of the Person (i.e., weight at birth). The process appears to have made its greatest impact on young children growing up in the most disadvantaged environment (i.e., the lowest socioeconomic level), but in that environment, it is those who at birth were of normal weight who benefited most. Moreover, it was in this same disadvantaged Context that, under high levels of maternal responsiveness, birthweight showed its most consistent effect, with the number of behavior problems steadily rising as birthweight fell. Finally, across the board, maternal responsiveness had the general result of decreasing or buffering against environmental differences in developmental outcome. Thus, at high levels of mother-child interaction, social class differences in problem behavior became much smaller.

From the perspective of developmental science, what is most noteworthy about these findings is not their specific content but that their simultaneous discovery was made possible by a research design based on a theoretical model that allowed for the emergence of patterns of this form. Not only are the four key components of Process, Person, Context, and Time all represented but the design also provides for the detection of the kinds of synergistic[1] interdependencies among these components that are posited in the bioecological model as a dynamic theoretical system. Two specific examples of such interdependencies are revealed in the analysis of Drillien's data:

1. Proposition II stipulates that the developmental effects of proximal processes vary as a joint function of

[1] *Synergism* refers to "cooperative action of discrete agencies such that the total effect is greater than the sum of the two or more effects—taken independently" (*Webster's Third New International Dictionary).*

Person and Context; that is, the indirect effects of Person and Context on the relation of Process to outcome are not to be conceived as simply additive. Consistent with this expectation is the finding that proximal processes had their greatest impact in the most disadvantaged environment but on the healthiest infant. The combination of Person and Context exhibit a mutually reinforcing, multiplicative, indirect effect on the power of proximal processes as the "engines of development."

2. In Drillien's research, the frequency of problem behaviors was assessed at two points in time—first when the infants were 2-years-old, and then again at 4-years-old. If one makes the not unreasonable assumption that mothers continued to interact with their children over the intervening period, then the results shown in Figure 14.2 provide evidence for the effect of proximal processes that have taken place over an extended period of time. Youngsters experiencing low levels of interaction with their mothers exhibited an accelerating increase in the number of problem behaviors from 2 to 4 years of age, whereas those exposed to substantially higher levels of this proximal process showed only a modest rise.

Developmental Science in the Discovery Mode

What about the possibility that the preceding results are chance findings? Some of them are statistically significant, yet others could not be tested because the variances needed for calculating error estimates were not reported. But that is not the principal issue at stake. With concrete examples of the relation between theoretical and operational models now before us, we can address what turns out to be a complex and consequential question: What is the function of research design in the bioecological model? The first point to be made in this regard is that the main function is not the usual one of testing for statistical significance. Rather, the research design must provide for carrying out an equally essential and necessarily prior stage of the scientific process: that of *developing hypotheses of sufficient explanatory power and precision to warrant being subjected to empirical test.* We are dealing with science in the *discovery mode* rather than in the *mode of verification.* In this earlier phase, theory plays an even more critical role. From its very beginnings, the bioecological model, through its successive reformulations, represents a sustained effort to meet this scientific need.

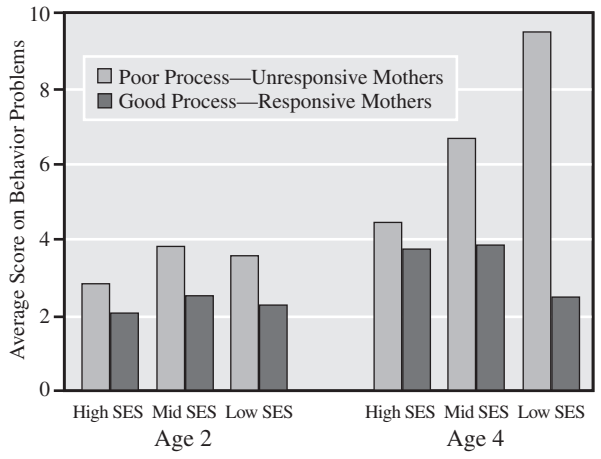


Figure 14.2 Effect of mother's responsiveness on problem behavior of child at ages 2 and 4 by social class.

What are the appropriate characteristics of research designs for developmental science in the discovery mode? Finding an answer to this question is complicated by the fact that, compared with the physical and natural sciences, developmental science is admittedly still in an earlier stage of development. Furthermore, because its scope falls between the natural and the social sciences, the discovery process must to some extent be adapted to the requirements of both. Perhaps in part for these reasons, we were unable to find any discussion of the issue in the developmental literature. Under these circumstances, we concluded that the best we could do was to try to make explicit the characteristics of the research designs that had been employed over the past several years to arrive at successively more differentiated formulations of the bioecological model.

These design characteristics depend on the constructs, and the possible relations between them, that are posited in the theoretical model at its present stage of development. Both the constructs, and the possible interrelationships, have been indicated in Propositions I and II, but as yet they appear in a relatively undifferentiated form. For example, the directions of the expected effects of Person and Context on proximal processes for different types of outcomes are not specified. The reason for such lack of specificity is that a more precise formulation could not be deduced either from the theory in its present, still evolving state, or induced from any already available data (at least, to our knowledge). Given these limitations, we concluded that an appropriate design strategy at this point in the discovery process could be one that involves a series of progressively more differentiated formulations and corresponding data

analyses, with the results at each successive step setting the stage for the next round. The research designs employed must be primarily generative rather than confirmatory versus disconfirming.

In this generative process, implications derived from the theoretical model play a more prominent role than those drawn from research findings, but the latter are also critical. Their importance is best conveyed by specifying a key feature of the corresponding research design: It must provide a structured framework for displaying the emergent research findings in a way that reveals more precisely the pattern of the interdependencies that are obtained in the data available. Of primary scientific interest are not those aspects of the observed pattern already anticipated in the existing theoretical model, but those features that point to more differentiated and precise theoretical formulations. These can then be evaluated in the light of new evidence, and, if deemed scientifically promising, can be incorporated in the research design for a next step. The proposed strategy for developmental investigations in the discovery mode involves an iterative process of successive confrontations between theory and data leading toward the ultimate goal of being able to formulate hypotheses that both merit and are susceptible to scientific assessment in the verification mode.

In presenting this definition of the discovery mode, we acknowledge that, in actual scientific practice, it is hardly likely to be a discovery. The process we have described, or something like it, is what scientists have always done. Our primary reason for seeking to make that process explicit was the belief that doing so could further the discovery process. But we also hope that the explication and examples of the discovery mode presented in this chapter will have broader utility in developmental research.

To return to the task at hand, the proposed criteria have more specific implications for the critical role in research design played by statistical analysis. First, in the discovery phase, Type I errors can entail an even greater risk than errors of Type II. To state the issue more broadly, dismissing as invalid a finding that points the way to a fuller and more precise explanation for the phenomenon under investigation may result in a greater loss than that produced by accepting a finding that is highly significant because of as yet undifferentiated and thereby confounded factors producing the phenomenon in question (e.g., the failure to distinguish Process from Context). The greater risk in the discovery process of dismissing findings as Type I errors is further compounded by the phenomenon of magnification of early environmental differences over time. Thus, as illustrated by the escalating effects of proximal processes shown in Figure 14.2, changes in outcome associated with a proximal process at Time 1 can be quite small and nonsignificant statistically. Yet, as shown, they can be powerful predictors of a marked increase in developmental outcome several years later (in the likely event that the process continued to be maintained over the intervening period).

At this point, a methodological note is in order. Statistical models widely used for the purpose of hypothesis testing are often ill-suited as operational models for developmental investigations in the discovery mode. This is particularly true for models that control statistically solely for *linear* relationships among the factors in the research design to obtain an estimate of the independent contribution of each factor in the statistical model to the outcome under investigation. The validity of such analyses rests on what in mathematical statistics is referred to as "the assumption of homogeneity of regression." To illustrate the assumption in its simplest general case: given a dependent variable y and two independent variables x_1 and x_2, then the relation between x_1 and y must be the same at all levels of x_2. This assumption is often not met in developmental data. For example, when applied to the analysis shown in Figure 14.2, it would require that the relation between proximal process and frequency of problem behaviors be the same at every social class level, which is not the case. Nor is this requirement likely to hold with respect to any combination of the four defining properties of the bioecological model. As Bronfenbrenner stated in his 1979 monograph, *"In ecological research, the principal main effects are likely to be interactions"* (p. 38, italics in original).

Any research design based on a bioecological model must allow for the possibility of such interactions. However, it is also essential, especially in the discovery phase, that the particular interactions to be examined be theoretically based, and that—if possible—their anticipated direction and form be specified in advance so that discrepancies between theoretical expectation and observed reality can be readily recognized and thus provide the basis for a next step in the typically slow, iterative process of seeking more differentiated formulations that merit further exploration both on theoretical and empirical grounds. In each case, the new formula-

tion should be consistent with the existing theoretical specifications of the bioecological model, but it also must take into account any old or new research findings bearing on the issue.

The foregoing criteria for research in the discovery mode do not imply neglect of the traditional issues of reliability and validity. These are honored in a somewhat different, theoretically guided way. Essentially, the process is one of cross-validation at two levels. First, in a given study, the results at each successive stage of analysis are validated in the next, more differentiated formulation. Second, the generalizations emerging from a given investigation are cross-validated against findings from other studies of theoretically related phenomena but with a specific focus on the defining components of the bioecological model.

Before we proceed with concrete examples, it is important to emphasize that the criteria we have proposed and applied for conducting developmental science in the discovery mode represent a first attempt to construct a working model. Moreover, the working model is subject to the curious qualification that it is itself the product of the same sequential design that it proposes. The criteria were developed by examining the changes introduced at each successive stage in the evolution of the bioecological model to identify the theoretical and operational properties leading to improvement in the model's predictive power. The example that follows illustrates these concurrent processes.

Different Paths to Different Outcomes: Dysfunction versus Competence

In this instance, our exploratory effort took as its point of departure the stipulation in Proposition II that the effects of proximal processes vary systematically depending on the developmental outcome. Once again, rather than taking time to retrace our steps, we begin with where we ended up; namely, with the following initial formulation:

> The greater developmental impact of proximal processes on children growing up in disadvantaged or disorganized environments is to be expected to occur mainly for outcomes reflecting developmental *dysfunction.* By contrast, for outcomes indicating developmental *competence,* proximal processes are posited as likely to have greater impact in more advantaged and stable environments.

The term *dysfunction* refers to the recurrent manifestation of difficulties on the part of the developing person in maintaining control and integration of behavior across situations, whereas *competence* is defined as the demonstrated acquisition and further development of knowledge and skills—whether intellectual, physical, socioemotional, or a combination of them (e.g., learning how to care for a young infant involves all three).

The preceding emergent formulation is based on the following considerations. Most parents have the capacity and the motivation to respond to manifestations of physical or psychological distress on the part of their children. In deprived or disorganized environments, such manifestations of dysfunction have been shown to be both more frequent and more severe (e.g., in Drillien's research), thus drawing on more of parents' available time and energy. Accordingly, to the extent that, in disadvantaged settings, parents are able to engage in proximal processes, these are likely to have greater impact in reducing dysfunction rather than in enhancing their children's knowledge about and skill in dealing with the external environment. With respect to problems of dysfunction, in deprived environments there is usually a match between young children's needs and their parents' capacity to meet those needs. This does not mean, however, that children in such environments will end up functioning as well as their age-mates growing up in more favorable circumstance, but rather that, over similar periods of time, they will show greater improvement in control over their own problem behaviors as a function of parental responsiveness.

The situation in advantaged and stable environments is rather different. Manifestations of dysfunction are likely to occur less often and to be less intense. Under these circumstances, parents are more apt to be attracted by and respond to the more frequent and more gratifying signs of their children's growing competence, with the result that proximal processes may to be focused mainly in this latter sphere. In addition, parents living in a middle-class world are themselves more apt to possess and exhibit the knowledge and skills they wish their children to acquire. They also have greater access to resources and opportunities outside the family that can provide needed experiences for their children. Taken together, the foregoing considerations led to the formulation of the previously stated "proto-hypothesis."

Because Drillien's study of the influence of mother-infant interaction dealt with only one developmental outcome, one has to look elsewhere for evidence that effects of such processes vary depending on the nature of the outcome under consideration. A rich data archive generously

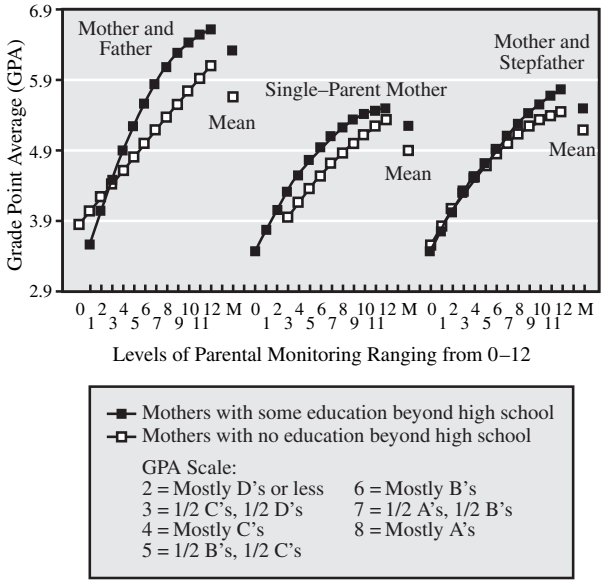


Figure 14.3 Effect of parental monitoring on grades in high school by family structure and mother's level of education. Analyses and graph based on data archives generously provided by Professors Stephen A. Small (University of Wisconsin) and Tom Luster (Michigan State University).

made available by Small and Luster (1990) from their statewide studies of youth at risk in Wisconsin met this need.[2] Figure 14.3 depicts the results from an analysis of the differential effects of parental monitoring on the academic achievement of high school students living in one of the three most common family structures found in the total sample of over 2,500 cases.[3] The students were between 14 and 16 years of age. It was also possible to stratify the sample by two levels of mother's education, with completion of high school as the dividing line. Parental monitoring refers to the effort by parents to keep informed about and set limits on their children's activities outside the home. In the present study, it was assessed by a series of items in a questionnaire administered to adolescents in their school classes. All items referred to parents in the plural, with no distinction as to whether the mother or the father was doing the monitoring. Levels of parental monitoring, ranging from 0 to 12, are shown on the horizontal axis, and grade point average (GPA) is shown on the vertical. The markers to the right of each curve record the mean GPA for each of the six groups.

Once again, the results reveal that the effects of proximal processes are more powerful than those of the environmental Contexts in which they occur. In this instance, however, the impact of the Process was greatest in what emerges as the most advantaged ecological niche—families with two biological parents in which the mother had some education beyond high school. Moreover, the developmental effect of the proximal process on school grades—a measure of *competence*—was stronger for families living in more advantaged socioeconomic circumstances. This finding is directly opposite to that revealed by the analysis of Drillien's data, where the outcome was one of psychological dysfunction (i.e., the frequency of problem behaviors). At the same time, the principal finding from both studies documents the powerful effect of proximal processes on human development, a result consistent with the first defining property of the bioecological model stipulated in Proposition I.

The reader may well ask why the data in each scattergram were fitted to a curve with a declining slope rather than simply with a straight line. In accord with the criteria for research in the discovery mode, the introduction of the quadratic term was based on theoretical considerations. Higher levels of academic performance require mastery of more complex tasks, and hence are more difficult to achieve. As a result, at each successive step, the same degree of active effort would be expected to yield a somewhat smaller result. More specifically, for pupils who are not doing so well in school, parental monitoring

[2] The analyses of data from the Wisconsin archive reported in this chapter were carried out in collaboration with Stephen A. Small (University of Wisconsin) and Tom Luster (Michigan State University) who designed and conducted the survey from which the data are drawn. We are deeply indebted to them for the theoretical thinking that underlies the construction of the survey. It is an excellent example of developmental science in the discovery mode. We are also grateful to Regina Cannon (then a graduate student at Cornell University) who carried out the statistical analyses with care and dispatch.

[3] The large number of cases in this study should not be taken to imply that the bioecological model can be applied only in samples with a large *N*. As illustrated here, precision in the formulation of the theoretical model and in its translation into a closely corresponding research design can produce reliable findings even when there are relatively few cases in some, or even all, the cells of the model. This comes about because, in effect, the bioecological model requires, in its discovery phase, advance specification primarily not only of main effects but also in the form and direction of their most plausible interactions in the light of both the evolving theoretical model and the then available research evidence. This is especially true for well-designed experiments. For examples, see pp. 808–809.

can have a substantial effect by ensuring more stability of Time and place so that *some* learning can occur. But for superior school achievement, students would require in addition high levels of motivation, focused attention, prior knowledge, and—especially—actually working with the material to be learned. These are all qualities that stability of Time and place by itself cannot provide.

As can be seen in Figure 14.3, the relation between parental monitoring and school grades shows a curvilinear trend. Moreover, in accord with criteria for research in the discovery mode (see pp. 801–803), both in its direction and form the trend corresponds with theoretical expectations in being more pronounced when the mother has some education beyond high school, especially in a two-parent family structure. A test for heterogeneity of regression confirms visual inspection. The differences in slopes between the two educational levels are highly significant ($p \leq .01$), with the quadratic component emerging as reliable only in the higher educational group.[4] Also statistically significant are differences in school achievement by family structure in each level of mother's education, with students growing up in two-parent families getting the highest grades, and those from single-parent families the lowest, a rank order corresponding to the power of the proximal process in each group as measured by the slopes of the associated regression coefficients.

Finally, a result not shown on the graph provides additional evidence pointing to another tentative generalization. The first indication appeared in the analysis of Drillien's data, which, among other findings, revealed that maternal responsiveness had the general effect of decreasing or buffering against environmental differences in developmental outcome. Thus, at high levels of mother-child interaction, social class differences in problem behavior became smaller. A similar pattern emerges for the effects of parental monitoring on school grades. Across the six groups shown in Figure 14.3, stronger parental monitoring was associated not only with a higher mean on school performance but also with a lower standard deviation. These differences, too, were statistically reliable. Hence the following working hypothesis:

> For outcomes of *competence,* proximal processes not only lead to higher levels of developmental functioning but also serve to reduce and act as a buffer against effects of disadvantaged and disruptive environments.

To turn from substance to method, the foregoing findings also demonstrate that tests of significance have a place in research in the discovery mode, but, as with hypothesis verification, only *after* a specific theoretical expectation has been formulated in advance.

In a discovery context, however, the aim is not to claim empirical validity for a particular theoretical formulation but to indicate its plausibility for inclusion in the research design at subsequent stages of exploratory work. To be sure, doing so may result in a failure of replication. But *not* doing so risks missing potentially important, theoretically guided research opportunities not yet recognized. Garmezy and Rutter (1983), in their landmark studies of stress and coping in children's development, did not differentiate between those protective or disruptive forces emanating from the environment, and those inherent in the biopsychological characteristics of the person. As evidenced from the analysis of Drillien's data shown in Figure 14.1, these vectors do not always operate in the same direction. Nevertheless, Garmezy and Rutter's formulations and findings played a significant role in the early stages of the process through which the bioecological model reached its present, still-evolving form.

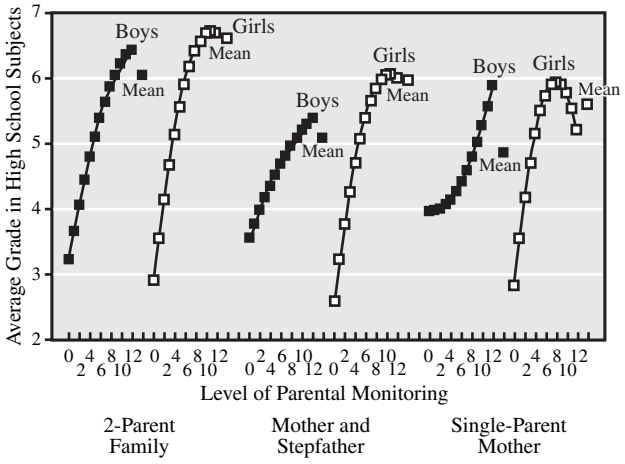
The still-evolving form imposes the obligation to take advantage of existing opportunities for continued exploration. With respect to the present inquiry, the next step in that process was once again to pose the question about the extent to which the research design meets the defining properties of the bioecological model. At first glance, we appear to be confronted with the same problem that we encountered with Drillien's study. Proposition I defines proximal processes as bidirectional. As previously noted, Small and Luster (1990) defined parental monitoring as the effort by parents to keep informed about and set limits on their children's activities outside the home. As stated, such behavior implies influence from one side only—that of the parents. An examination of the actual items used in their questionnaire, however, revealed that they were of two kinds. Some were cast in the language of parental expectation and prescription (e.g., "If I am going to be home late, I am expected to call my parent(s) to let them know"; "When I go out, my parent(s) ask me where I'm going"). By contrast, other items implied that the desired expectations or prescriptions were being met (e.g., "My parent(s) know where I am after school"; "I tell my parent(s) who

[4] The degree of curvilinearity is measured by the corresponding regression coefficients and not by difference in the length of each curve from top to bottom. The latter is determined by empty cells in the scatter plot below or above which entries for *both* monitoring level and GPA were available.

I'm going to be with before I go out"). Although the first type of item is unidirectional, the second entails some degree of reciprocity to the extent that the adolescent is providing the information desired by the parents. Accordingly, we hypothesized that items of the second type would show stronger relationships to developmental outcomes than those that described only the parents' expectations of how they wished their children to behave.

Separate analyses of scales based on each type of item provided substantial support for our working hypothesis. Although responses to both types of questions showed reliable effects on school performance, the relationships for the reciprocity scale were significantly stronger and were much more likely to show curvilinear effects. Accordingly, the latter was the scale used in analyzing the results presented in Figure 14.3.

From the perspective of the biological model, the research design producing the results shown in that figure is missing an important Person component. It is a general finding in educational research that at the high school level female students score higher on measures of academic performance than do males. The question therefore arises: To what extent is this gender difference attributable to variations in proximal process? Figure 14.4 provides a tentative answer to this question for students whose mothers had more than a high school education. In each family structure, parental monitoring exerted a more powerful effect on the school achievement of girls than of boys, a result that is paralleled by corresponding differences in average GPA for the two sexes.[5] In each of the three family structures, girls received higher grades than boys, with the difference being most pronounced in two-parent households and lowest in single-mother families.



High school students are between 14 and 16 years old.

Figure 14.4 Parental monitoring and high school grades by gender: mothers with more than a high school education. Analyses and graph based on data archives generously provided by Professors Stephen A. Small (University of Wisconsin) and Tom Luster (Michigan State University).

As seen in Figure 14.4, however, a distinctive feature of the pattern for girls is a marked flattening of the curve, especially for daughters of single-parent mothers. This result suggests that, in each of the three family structures, mothers may be pushing their already successful daughters to the point where conformity to maternal control no longer brings educational returns, particularly when the mother is the only parent.

An analysis of data on students whose mothers had no more than a high school education showed a similar general pattern, but the effects were less pronounced. The influence of monitoring was appreciably weaker, and its greater benefit to girls was also reduced. Nevertheless, girls with less-educated mothers both in single-parent and in stepfamilies still had higher GPA scores than boys. This means that some other factor not yet identified must account for this difference.

Although a number of possibilities come to mind regarding this unknown, regrettably the Wisconsin archive does not contain any data on the principal suspects. What is available is information about another trail of discovery that we have already begun to explore. Our successively more differentiated working models, both conceptual and operational, for assessing the effects of parental monitoring on school achievement have provided increasing support for the tentative hypothesis that, for outcomes reflecting developmental *competence,* proximal processes are likely to have greatest impact in the most advantaged environments. But what about the other half of the original formulation: the complementary postulate that the greater developmental impact of proximal processes growing up in poor environments is to be expected to occur mainly for outcomes reflecting developmental *dysfunction?*

Data from Small and Luster's archive also provide the opportunity for cross-validating this provisional claim. In addition to measures of academic achievement, the Wisconsin study also included information on teenagers' sexual activity. The decision to analyze this outcome in the context of a bioecological model was prompted by Small and Luster's (1990) finding that such

[5] Within each pair, both means and regression coefficients were statistically significant, the latter confirming reliable differences in slope.

behavior varied systematically by family structure. Sexual activity was measured by a single question: "Have you ever had sexual relations with another person?"

This documentation of variations in sexual activity by family structure takes on special significance in the light of broader social changes taking place in the lives of children, youth, and families in contemporary U.S. society. Today, the United States has the highest rate of teenage pregnancy of any developed nation, almost twice as high as that of its nearest competitors (Bronfenbrenner, McClelland, Wethington, Moen, & Ceci, 1996, p. 117). Adolescent sexual activity is also one of the prominent elements in the so-called teenage syndrome, an escalating pattern of co-occurring behaviors including smoking, drinking, early and frequent sexual experience, adolescent pregnancy, a cynical attitude toward education and work, and, in the more extreme cases, drugs, suicide, vandalism, violence, and criminal acts (for references and successive summaries of the evidence, see Bronfenbrenner, 1970, 1975, 1986a, 1989c, 1990, 1992; Bronfenbrenner et al., 1996; Bronfenbrenner & Neville, 1994).

In anticipating the effects of parental monitoring on teenagers' sexual activity, we were again confronted with the issue of the possible direction of influence. In relation to sexual activity as an outcome, however, some leverage for the resolution of the issue was provided because each direction could be expected to produce opposite effects. On the one hand, if parental monitoring functions to defer sexual activity, then the more monitoring the less sexual activity. On the other hand, if the parents begin to monitor only after the fact, the association would be reversed, with monitoring occurring in reaction to the adolescent's behavior; hence, sexually active adolescents would be monitored more.

The results of the analysis are shown in Figures 14.5 and 14.6.[6] The most salient finding for both sexes is that parental monitoring does substantially reduce adolescents' sexual activity. In many other respects, however, the patterns for female and male adolescents are quite different. The results for girls in Figure 14.5 show that the effect of parental monitoring is stronger for daughters of mothers with no education beyond high school—a finding consistent with the working hypothesis

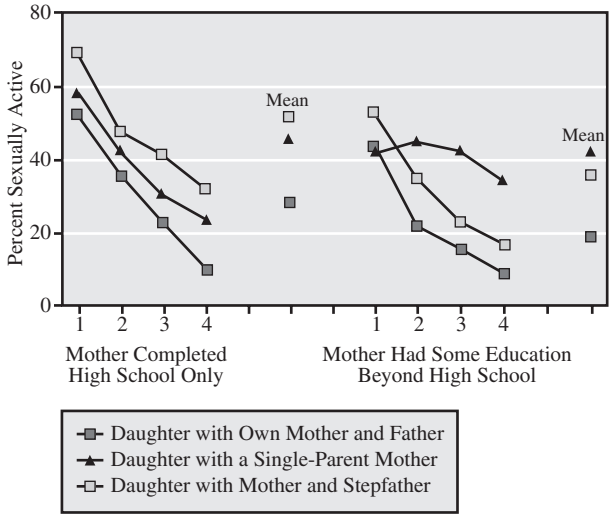


Figure 14.5 Effect of monitoring on girls' sexual activity (high school students between 14 and 16 years of age).

that, for outcomes reflecting lack of control, proximal processes have greater impact in poorer environments. Tests for heterogeneity of regression confirm that this finding holds for each of the three family forms.

Yet, as shown in Figure 14.6, the corresponding analysis of the data for boys reveals the very opposite result. Parental monitoring has a more powerful effect on boys whose mothers have had *more* education rather than less. Once again, the finding holds in each family structure and is confirmed by tests for heterogeneity of regression.

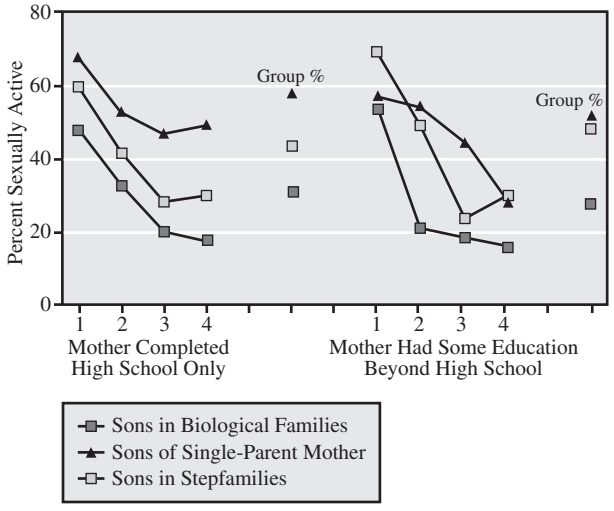


Figure 14.6 Effect of parental monitoring on boys' sexual activity (high school students between 14 and 16 years of age).

[6] We are also indebted to Kristen Jacobson, now a doctoral student at Pennsylvania State University, for her ingenuity and accuracy in translating into a common format data archives recorded on different computing systems.

This is not the only departure from the expectations generated by the most recent working model. For example, there was not always correspondence between the developmental power of proximal processes in a given family structure and the percentage of sexually active adolescents in that structure: In stepfamilies in which the mother has only a high school education, maternal monitoring of daughters is as high as it is in two-parent families, but the percentage of sexually active girls is even greater than that for single-parent mothers at the same educational level. The finding is consistent with research indicating that living in a family with a stepfather entails a special developmental risk for girls (Hetherington & Clingempeel, 1992).

And so, we find ourselves engaged in a next stage of the discovery process in which we are seeking to develop a more differentiated formulation that, through a corresponding research design, will be most effective in reducing the observed empirical departures from expectations based on the existing working model. The first step is to ask an obvious question: What is most likely to account for such discrepancies? Restating the question from the perspective of the bioecological model, which of the four components is a likely suspect? It has to be somebody who is already on the scene. Parents are already there. Who else is around who could exert some influence on the sexual activity of high school students? The question answers itself—the peer group. And if it is indeed true that proximal processes are at least as powerful determinants of development as either the characteristics of the person or of the environment, what might that process be?

A tentative first nomination is *progressively more intense interaction with peers who are already sexually active*. Among other considerations, this suggestion is guided by the possibility that peer pressure to engage in sexual activity and the prestige that such activity brings are likely to be higher for boys from less educated families with the result that parental monitoring is not as effective. With respect to the other components in the model, given the findings just reported, gender would still be a Person characteristic of major importance. The choice of an appropriate environmental Context depends on the precise research question being asked. Family structure would also still be appropriate. But from the perspective of the bioecological model, an option to consider would be the parents' beliefs about the activities they wanted their adolescent son or daughter to engage in or refrain from, as well as the closeness of the parent-child relationship.

We offer these suggestions not for their relevance to this particular issue but to illustrate two additional emergent corollaries of the bioecological model:

1. The specific components of Process, Person, Context, and Time to be included in a given investigation should be those that, from a theoretical perspective, are maximally relevant to the research question under investigation and complementary to each other in relation to the given developmental outcome.
2. From a theoretical perspective, the power of a PPCT design is most effectively enhanced by including more than one proximal process in the model.

The next section leads to yet another corollary.

The Role of Experiments in the Bioecological Model

The examples considered thus far are essentially experiments of nature: They show how development is influenced by variations in the components of the bioecological model occurring in already existing societies. They tell us nothing about whether, to what extent, or how these elements and their combinations can be changed. This limitation applies particularly to the most consequential component of the bioecological model—proximal processes. We know of no research bearing specifically on this question, but some indirect evidence does exist. In research findings already presented, improving the quality of the environment has been shown to increase the developmental power of proximal processes. The indirect evidence comes from experiments in which researchers have systematically introduced conditions into the environment in which people lived that were hypothesized to enhance their psychological functioning beyond existing levels.

Here are two examples at contrasting ages.

Environmental Dynamics in Old Age

The first example is Langer and Rodin's oft-cited experimental intervention conducted with residents of a New Haven nursing home for the aged (Langer & Rodin, 1976; Rodin & Langer, 1977). The contextual manipulation employed in this study is well summarized in the authors' words:

> The hospital administrator gave a talk to residents in the experimental group emphasizing their responsibility for themselves, whereas the communication to a second, comparison group stressed the staff's responsibility for them as patients. To bolster the communication, residents in the experimental group were offered plants to care for, whereas residents in the comparison group were given plants that were watered by the staff. (Rodin & Langer, 1977, p. 897)

Residents were assigned at random to either the experimental or the control group. Data on psychological and health characteristics were collected at three time points: (1) just prior to the introduction of the experiment; (2) 3 weeks later, when the experiment was formally ended; and (3) in a follow-up study conducted 18 months later.

The substantial effects of intervention found at the end of the experiment (Langer & Rodin, 1976) were still in evidence in the follow-up assessment. To be sure, because the residents were almost a year-and-a-half older, the added age had taken some toll, but, nevertheless, those in the "induced responsibility" group not only significantly surpassed their controls, but were appreciably better off, both psychologically and physically, than they had been months earlier before the intervention had begun. In ratings by observers blind to the experimental conditions, they were judged to be more alert, sociable, and vigorous. The most striking results were seen in the comparison of death rates between the two treatment groups. Taking the 18 months prior to the original intervention as an arbitrary comparison period, in the subsequent 18 months following the intervention, 15% in the "responsibility-induced" group died, compared with 30% in the control group.

Environmental Dynamics in Infancy

A remarkable, independent cross-validation of Langer and Rodin's principal hypothesis appears in the findings of another intervention experiment—this one almost unknown—that was carried out at about the same time with a sample of 100 9-month-old infants and their mothers in the Dutch city of Nijmegen (Riksen-Walraven, 1978). Although this author, Marianne Riksen-Walraven, appears not to have been aware of Langer and Rodin's work conducted during the same period, one of the two intervention strategies she employed with her sample of infants was similar to that used in the New Haven study of elderly patients. Mothers, randomly assigned to what Riksen-Walraven called the "responsiveness" group, were given a "workbook for parents" stressing the idea that "the infant learns most from the effects of its own behavior" (p. 113):

> Caregivers were advised not to direct the child's activities too much, but to give the child opportunity to find out things for himself, to praise him for his efforts, and to respond to his initiations of interaction. (p. 113)

By contrast, mothers of infants in the "stimulation" group received a workbook that emphasized the importance of providing the infant with a great variety of perceptual experiences of all kinds, "to point to and name objects and persons," and "to speak a lot to their infants" (p. 112).

In the follow-up assessment conducted 3 months later, infants of mothers who had been encouraged to be responsive to their babies' initiatives exhibited higher levels of exploratory behavior and were more likely to prefer a novel object to one that was already familiar. The babies also learned more quickly in a learning contingency task.

Neither of the preceding investigations included any systematic assessment of the activities in which the participants in the experiment subsequently engaged, of the balance between unidirectional and bidirectional behavior in the two groups, or of any other specific feature that could provide a measure of the extent to which proximal processes were operating in each of the two contrasting experimental conditions.

In both of the preceding experimental studies, elegant as they are, the keystone of the bioecological model—a measure of proximal process—was not included in the research design. In addition, the demonstration (in Figure 14.3) of the joint, indirect effects of family structure and parents' education on the relation of proximal processes to school grades does only half the job, for it provides no information on whether differences in students' personal characteristics (such as gender) exert a similar indirect effect. Nevertheless, viewed from the theoretical perspective of a bioecological model, all these findings are impressively consistent with expectations derived from the model; the findings illustrate the model's practicability, and—perhaps most promising for the future of developmental science—generate questions that, when answered, provide ways for enhancing the model's scientific power. It is these questions and answers that are addressed in the following sections.

Up to this point, our exposition has given primary attention to the core concept of proximal process and its

key position in the bioecological model as a whole. We now proceed to a more detailed examination of each of the other three defining properties of the model—Person, Context, and Time.

HOW DO PERSON CHARACTERISTICS INFLUENCE LATER DEVELOPMENT?

As already indicated, at midstage in the development of the bioecological model, an effort was begun to arrive at some answers to this question, and it has continued up to the present day. As before, rather than describe the successive stages in this emergent reconception, we present it in its most recent, still-evolving form.

Most developmental research treats the cognitive and socioemotional characteristics of the person as dependent variables; that is, as measures of developmental outcomes. Far less often are such characteristics examined as precursors and producers of later development From the perspective of the bioecological model, their effectiveness in the latter role derives from their capacity to influence the emergence and operation of proximal processes.

Accordingly, in an effort to identify such process-relevant Person characteristics, we applied the sequential design strategy described in the preceding section. Beginning with implications derived from the theoretical model, which are then related to existing research findings, successive applications of this strategy have resulted in the conceptualization of three kinds of process-relevant Person characteristics, which, for convenience of brevity, we have labeled as Person *forces, resources,* and *demands.*[7]

Force Characteristics as Shapers of Development

In the bioecological model, the characteristics of the Person most likely to influence future development would be active behavioral dispositions that can set proximal processes in motion and sustain their operation, or—conversely—actively interfere with, retard, or even prevent their occurrence. It is therefore useful to distinguish between these two propensities. We refer to the former as *developmentally generative* characteristics; to the latter as *developmentally disruptive.*

Examples of developmentally disruptive dispositions come more readily to mind. At one pole, they include such characteristics as impulsiveness, explosiveness, distractibility, inability to defer gratification, or, in a more extreme form, ready resort to aggression and violence; in short, difficulties in maintaining control over emotions and behavior. At the opposite pole are such Person attributes as apathy, inattentiveness, unresponsiveness, lack of interest in the surroundings, feelings of insecurity, shyness, or a general tendency to avoid or withdraw from activity.[8] Persons exhibiting either of the preceding propensities would find it difficult to engage in proximal processes requiring progressively more complex patterns of reciprocal interaction over extended periods of time.

By contrast, developmentally generative characteristics involve such active orientations as curiosity, tendency to initiate and engage in activity alone or with others, responsiveness to initiatives by others, and readiness to defer immediate gratification to pursue long-term goals.

We have found few investigations that shed light on the developmental effects of either type of dynamic characteristics on proximal processes and their outcomes. A major reason for this shortcoming is the absence of theoretical constructs for conceptualizing their changing nature over the course of development from early infancy, through adolescence, into and beyond early adulthood. The following framework is offered as an initial basis for meeting this requirement beginning in the Person domain in greater need of conceptual definition—that of developmentally generative characteristics. The corresponding structure for developmentally disruptive Person qualities can then be derived as an inverted mirror image of the former.[9]

Developmentally Generative Dispositions in Life-Course Perspective

The first and earliest manifestation of generative dispositions takes the form of what we call *selective responsiveness.* It involves differentiated response to, attraction by, and exploration of aspects of the physical and social environment.

[7] As is documented later in this chapter (p. 819), the recently renewed, and far stronger, claims by behavior geneticists for the predominant role of genetic factors in determining both individual and group differences in all forms of human characteristics are directly challenged by alternative explanations and research findings derived from the bioecological model.

[8] Depending on the available alternatives, withdrawal may be the only course left for dealing with an unbearable situation.

[9] The material that follows represents a further development by the present authors of ideas first introduced in Bronfenbrenner (1989).

The next generative characteristic to evolve goes beyond selective responsiveness to include the tendency to engage and persist in progressively more complex activities; for example, to elaborate, restructure, and even to create new features in our environment—not only physical and social but also symbolic. We refer to propensities of this kind as *structuring proclivities.*

The transition from one to the other of these dynamic forms of orientation during early childhood is illustrated in successive publications from a longitudinal study of infants being carried out by Leila Beckwith, Sarale Cohen, Claire Kopp, and Arthur Parmelee at UCLA (Beckwith & Cohen, 1984; Beckwith, Rodning, & Cohen, 1992; Cohen & Beckwith, 1979; Cohen, Beckwith, & Parmelee, 1978; Cohen & Parmelee, 1983; Cohen, Parmelee, Beckwith, & Sigman, 1986). Their imaginative and careful work reveals a progressive sequence of such environmentally oriented dispositions from birth through 7 years of age. Thus, immediately after birth, infants are especially responsive to vestibular stimulation (being picked up and held in a vertical position close to the body), which has the effect of soothing babies so that they begin to engage in mutual gazing; by 3 months, visual exploration extends beyond proximal objects, and the mother's voice is most likely to elicit responses especially in the form of reciprocal vocalizations.

From about 6 months on, the infant begins actively to manipulate objects spontaneously in a purposeful way and to rearrange the physical environment. By now, both vocalization and gesture are being used to attract the parents' attention and to influence their behavior. In addition, there is a growing readiness, across modalities, to initiate and sustain reciprocal interaction with a widening circle of persons in the child's immediate environment. This is the emergence of what we call structuring proclivities.

A number of other investigations have yielded comparable findings, and have extended them to still other activity domains; for example: individual differences in children's creativity in play and fantasy behavior (Connolly & Doyle, 1984; MacDonald & Parke, 1984) or Jean and Jack Block's longitudinal studies of "ego resiliency" and "ego control" (J. H. Block & Block, 1980; J. Block, Block, & Keyes, 1988).

The nature of the third and final class of developmentally generative Person characteristics reflects the increasing capacity and active propensity of children as they grow older to conceptualize their experience. It deals with what we call *directive belief systems* about oneself as an active agent both in relation to the self and environment, or, for short, *directive beliefs.* The oldest concept of this kind is Rotter's construct and measure of "locus of control" (Rotter, 1966). Subsequently, a more sophisticated formulation of the concept was introduced by Bandura (1977, 1982) under the rubric of self-efficacy. The principal distinction between these earlier constructs and their counterparts in the bioecological model is that the latter are conceptualized primarily not as characteristics of the person sufficient unto themselves but as directional dispositions interacting synergistically with particular features of the environment to generate successive levels of developmental advance.

The closest approximation to an operationalized bioecological model in which directive beliefs function as Person characteristics appears in a series of findings arising from a doctoral dissertation by Tulkin (1973, 1977; Tulkin & Cohler, 1973; Tulkin & Kagan, 1972). The investigator studied social class differences both in the behaviors and the beliefs of mothers of 10-month-old girls. The research was conducted in the home, employing both interviews and observations. Middle-class mothers were distinguished from their working-class counterparts not only by higher levels of reciprocal interaction with their infants, but also in their views about what a 10-month-old could do, and about their own abilities to influence their baby's development; the more advantaged mothers attributed greater potentials both to their infants and themselves. In addition, the correlations between maternal behavior and attitudes were substantially greater in middle-class than in lower-class families. Several years later, Tulkin and a colleague (Tulkin & Covitz, 1975) reassessed the same youngsters after they had entered school. The children's performance on tests of mental ability and language skill showed significant relationships to the prior measures of reciprocal mother-infant interaction.

Perceptive readers may have detected a sleight of hand in our analysis of Tulkin's research when examined from the perspective of the bioecological model. In that framework, we have been discussing characteristics of the developing Person that influence proximal processes and their outcomes. In Tulkin's work, the developing Person is the infant. But the directive beliefs we have been discussing are those of the mother. The reason for the substitution is the following. Although, in the line of work stimulated by Rotter and Bandura there are many investigations of the relation between personal

beliefs and development, to our knowledge there have been no studies of the effect of personal beliefs on the proximal processes in which the developing person herself or himself becomes engaged. To provide an example, we resorted to a substitution of roles.

The substitution also provides an opportunity to introduce a corollary formulation, the evidence for which appears later in this and subsequent sections of this chapter:

> In proximal processes involving interpersonal interaction, the personal characteristics that influence the power of the process and its effects are the same for all parties involved.

To return to the task at hand, we present a second form of Person characteristic posited as affecting future psychological growth—what we have called developmental resources.

Resource Characteristics of the Person as Shapers of Development

These are Person characteristics that in themselves involve no selective disposition to action, but constitute biopsychological liabilities and assets that influence the capacity of the organism to engage effectively in proximal processes. In the first category are conditions that limit or disrupt the functional integrity of the organism. Some obvious examples include genetic defects, low birthweight, physical handicaps, severe and persistent illness, or damage to brain function through accident or degenerative processes. By contrast, developmental assets take the form of ability, knowledge, skill, and experience that, as they evolve over most of the life course, extend the domains in which proximal processes can do their constructive work—thereby becoming another source of the progressively more complex patterns of interaction constituting a defining property of proximal processes.

The similarity between the definitions for the two types of developmental resources, and for the earlier distinction between developmental outcomes reflecting dysfunction versus competence, derives from the fact already noted that characteristics of the Person appear on both sides of the bioecological equation. Developmental outcomes at Time 1 indirectly influence developmental outcomes at Time 2 through their effect on proximal processes during the intervening period. The difference, therefore, lies not in the concepts themselves but in their place in the bioecological model.

A concrete example of a deficiency in developmental resources has already been documented in the analysis of Drillien's results depicted in Figure 14.1. Proximal processes exerted their most powerful effect on children growing up in the most disadvantaged environment, but in that environment youngsters who at birth were of normal weight benefited most. Weight at birth does not imply a directed propensity to engage in or refrain from a particular kind of behavior. What it does represent is variation in the biological resources available to engage in any activity requiring directed activity or response over extended periods of time. Thus, in the present instance, one plausible explanation for the observed asymmetric pattern is that, among families living in stressful environments, infants who are physically healthy from birth are more able to engage in reciprocal interaction than those who are biologically impaired.

This interpretation is called into question, however, by the corresponding results, shown in the same graph, for infants raised under the most favorable socioeconomic circumstances. Infants of normal birthweight profited least from interaction with their mothers. How might this paradox be resolved?

Even though the corresponding interaction term is statistically significant, under normal circumstances the preceding result would—and properly should—be called into question as a post hoc finding. But, in the present instance, that is not quite the case. To be sure, there was no a priori hypothesis predicting the precise pattern of the obtained results. The pattern is consistent, however, with several possibilities envisioned for a third Person attribute posited as influencing proximal processes and their developmental effects. And for science in the discovery mode, post hoc findings that are theoretically relevant are not to be lightly dismissed.

Demand Characteristics of the Person as Developmental Influences

The distinguishing feature of this last set of Person characteristics affecting development is their capacity to invite or discourage reactions from the social environment that can disrupt or foster processes of psychological growth: for example, a fussy versus a happy baby, attractive versus unattractive physical appearance, or hyperactivity versus passivity. Half a century ago, Gordon Allport (1937), borrowing a term originally introduced by Mark A. May (1932), spoke of such characteristics as

constituting "personality" defined in terms of its "social stimulus value." Rephrasing this concept in terms of its analog in contemporary theories of perception, we refer to such Person qualities as *demand characteristics.*

A striking example of the developmental effect of such a feature emerges as a major finding in one of the follow-up studies of children of the Great Depression carried out by Elder and his colleagues (Elder, Van Nguyen, & Caspi, 1985). The investigators found that economic hardship adversely influenced the psychosocial well-being of girls (but not boys) through its tendency to increase the rejecting behavior of fathers. The effects of rejection, however, varied inversely as a function of the daughter's physical attractiveness. In the authors' words, "Attractive daughters were not likely to be maltreated by their fathers, no matter how severe the economic pressure. [The results] underscore the importance of viewing economic decline in relation to both the child's characteristics and parenting behavior" (p. 361). Here is a classic instance of the power of a PPCT model in revealing the complex interactions between organism and environment that drive the process of development.

The concept of demand characteristics also introduces a new perspective for interpreting the contrasting developmental effects of birthweight by social class shown in Figure 14.1. As noted earlier, at the lowest socioeconomic level it was the children of normal birthweight who benefited most from maternal responsiveness. But does that mean they were also the ones who got the most attention from their mothers? Paradoxically, the picture turns out to be just the reverse. Only 14% of these lower-class mothers were judged to be responsive to changes in their infants' state or behavior, whereas the percentage for mothers of low-birthweight babies was more than twice as high (averaging 37%). In short, lower-class mothers were responding mainly to those infants who most needed their attention, albeit with a lower return on their investment.

But what characteristics of these babies were capturing the mothers' attention? It appears likely that in this instance, the mothers were responding mainly to their infants' expressions of distress—behavior less apt to occur among those of normal birthweight. If we look at the corresponding data for families at the highest socioeconomic level, we discover a rather different picture. Mothers are more responsive to the healthiest infants than to those of lowest birthweight, but as shown in Figure 14.1, they get the least return for their pains. Once again a key question becomes "What is capturing the mother's attention?" A plausible answer for children of normal birthweight living in the most favored circumstances is that their mothers would be responding primarily not to manifestations of problem behavior, but of growing competence.

THE ROLE OF FOCUS OF ATTENTION IN PROXIMAL PROCESSES

The preceding considerations, generated by a confrontation of data with theory, call for more differentiated formulations in the existing bioecological model. Here is the first of two tentative responses to the call:

> When a proximal process involves interaction with another person, the power of the bioecological model is substantially enhanced by including in the research design a measure of the other person's *focus of attention on the particular aspects of the behavior of the subject that are presumed, on theoretical and empirical grounds, to be most closely related to the developmental outcome.*

For Drillien's study, the measure of proximal process is the mother's responsiveness, but we do not know to what particular behaviors of her baby she was responding. As already suggested, the aspect most relevant for reducing future problem behaviors might be expressions of distress. If so, a more precise conceptual and operational definition of the proximal process in this study would be the proportion of manifestations of distress that were responded to by successful efforts to reduce that distress.

However, even though in the Drillien study the mothers' focus of attention was not known, the extent of her responsiveness was still a strong predictor of the outcome. Even when the theoretical and operational requirements of the bioecological model are not met in full, the results can still contribute to understanding the forces that shape human development.

A second, complementary tentative formulation derives from the definition of proximal processes as bidirectional. Stated succinctly, it posits that the preceding formulation also holds in reverse:

> When a proximal process involves interaction with another person, the power of the bioecological model is substantially enhanced by including in the research design a measure of the developing person's *focus of attention on the particular aspects of the behavior of the other person that*

are presumed, on theoretical and empirical grounds, to be most closely related to the developmental outcome.[10]

PROXIMAL PROCESSES IN SOLO ACTIVITIES WITH OBJECTS AND SYMBOLS

The foregoing considerations and complexities give added importance to those proximal processes that do not involve interpersonal interaction but instead focus on progressively more complex reciprocal interaction with objects and symbols. These are activities that can be carried on in the absence of other persons, and therefore the magnitude and effectiveness of the proximal process are not influenced by another participant's behaviors. One would therefore expect that the person's own disposition and resources would play a far stronger role in affecting the direction and power of the proximal process than in the case of interpersonal interaction. Furthermore, such solo activities significantly change the processes involved, their outcomes, and the features of the environment that become most relevant. The contrast in all three domains involves a focus on *human relationships,* on the one hand, and *tasks,* on the other. To understand the developmental importance of this contrast requires a fuller exposition of the features of the environment that influence proximal processes and their effects.

But before turning to this topic, we must give due recognition to three other Person characteristics that push us in the same direction. They are so pervasive in affecting future development that their possible influence routinely needs to be considered in relation to the particular phenomenon under investigation. These are the familiar demographic factors of *age, gender,* and *ethnicity.* Another reason for this recommendation is that all three of these factors, although based on differing physical characteristics of the Person, also place that person in a particular environmental niche that defines his or her position and role in society. Recognition of that ambiguity moves us to a change in focus from the developmentally relevant characteristics of the Person to their counterparts in the structure and substance of environmental Contexts as they affect developmental processes and outcomes.

[10] In terms of research design, both of the stated formulations are best assessed through direct observation, but, given the clarity and contrasting nature of the predicted relationship, valid measures can be obtained for older children and adults through well-designed interviews, and even for young children from information provided by parents and other family members.

THE MICROSYSTEM MAGNIFIED: ACTIVITIES, RELATIONSHIPS, AND ROLES

In addressing this topic, we return to the earliest formulation of the ecological model. Today, as then, "the ecological environment is conceived as a set of nested structures, each inside the other like a set of Russian dolls" (Bronfenbrenner, 1979b, p. 3). The contemporary definition of the innermost of these structures is similar, but contains additional elements that link it to the "center of gravity" of the bioecological paradigm:

> A microsystem is a pattern of activities, social roles, and interpersonal relations experienced by the developing person in a given face-to-face setting with particular physical, social, and symbolic features that invite, permit, or inhibit, engagement in sustained, progressively more complex interaction with, and activity in, the immediate environment. (Bronfenbrenner, 1994, p. 1645)[11]

We begin with consideration of the first feature of the environment introduced in the foregoing definition.

Effects of the Physical Environment on Psychological Development

The pioneering work in this sphere has been done by Theodore Wachs. In 1979, he published a seminal paper in which he showed a consistent pattern of relationships between certain features in the physical environment of infants during the first 2 years of life and their cognitive development over this same period. To permit examining effects over time, data were grouped into successive 3-month blocks. The results are reported in the form of correlations between characteristics of the environment at an earlier time and the developmental status of the infants at a later time.

From the complex results of the study, we focus on those physical features in the environment that were most frequently and strongly associated with cognitive functioning. These included a physically responsive en-

[11] The 1979 definition reads as follows: "A microsystem is a pattern of activities, roles, and interpersonal relationships experienced by the developing person in a given setting with particular physical and material characteristics."

vironment, presence of sheltered areas, "The degree to which the physical set-up of the home permits exploration," low level of noise and confusion, and "the degree of temporal regularity" (Wachs, 1979, p. 30).

Regrettably, few researchers have followed the exciting scientific path that Wachs has been the first to chart. Taken as a whole, his original and subsequent work (Wachs, 1987a, 1987b, 1989, 1990, 1991; Wachs & Chan, 1986) suggests two areas especially worthy of further systematic investigation, in both conceptualization and measurement. The first remains strictly in the realm of the physical environment. The second raises the issue of proximal processes as they relate to that environment.

In the first domain, Wachs's findings point to two general aspects of the physical environment that can affect the course of cognitive development—one for better, the other for worse. On the constructive side are objects and areas that invite manipulation and exploration, whereas instability, lack of clear structure, and unpredictability of events undermine the developmental process. From an ecological perspective, the existence of these countervailing forces in the physical environment leads to a new working hypothesis:

> Not only do developmentally generative features of the surroundings have greater impact in more stable settings, but they also function as a buffer against the disruptive influences of disorganizing environments.

The second issue introduces an additional component into the research design. As stipulated in Proposition I, proximal processes involve progressively more complex interactions not only with persons but also with objects and symbols. The question therefore again arises as to what extent solitary activities involving objects and symbols—such as playing with toys, working at hobbies, reading, or fantasy play—can also foster psychological development? And to what degree does involvement in both objects and symbols produce synergistic developmental effects in each domain? The answers to these questions are as yet unknown but are readily discoverable through the use of appropriate designs that differentiate between measures of process and of environmental structure.

However, the most promising terra incognita for research on the role of the physical environment in human development may well lie beyond the realm of childhood in the world of adults. A preview of this promise appears in the successive publications of the sociologist Melvin Kohn and his colleagues (for an integrative summary, see Kohn & Slomczynski, 1990) demonstrating the powerful effect of work environments on intellectual development in adulthood. Of particular importance in this regard turns out to be the complexity of the task that a given job entails.

At the conclusion of the preceding section, we called attention to a contrast that cuts across all four domains of Process, Person, Context, and Developmental Outcome. The contrast in all four domains involves a primary focus on *relationships* versus *tasks.* The findings of both Wachs and Kohn fall mainly in the latter category, but Drillien's data on mother-infant interaction and infants' problem behavior in lower-class families fall mainly in the former (i.e., an increase in maternal responsiveness functions as a buffer against problems in this sphere of emotional and behavioral control).

But that is not the only effect of rising levels of proximal process.

The Mother-Infant Dyad as a Context of Development

A substantial body of research indicates that such processes also foster the development of a strong emotional attachment between mother and child, which increases the quality of future interaction between the two parties (Ainsworth, Blehar, Waters, & Wall, 1978; Bowlby, 1969, 1973). In addition, the more recent work in this sphere strongly suggests that, as a result of continuing reciprocity in the context of a close relationship, the infant begins to develop a definition of self that mirrors the form and content conveyed through the evolving patterns of interchange between mother and child (Sroufe, 1990). Thus, proximal processes become the measurable mechanisms for bringing about what in an earlier era of developmental theory and research was called *internalization.*[12] Moreover, this sequential process does double duty. Though operating primarily on the relationship side, it also furthers task performance.

According to attachment theory, the emotionally loaded patterns of interchange processes between the infant and the primary caregiver become internalized in the form of "internal working models" (Bowlby,

[12] A resurgence of theoretical and research interest in this sphere has been stimulated by the elegant studies of Kochanska and her colleagues.

1969, 1973). Such working models are representations of the infant in relation to others and become the basis for the development of the self (Sroufe, 1990). Through interactions between the infant and the primary caregiver, the infant develops expectations of the caregiver's behavior and complementary beliefs about him- or herself. For example, an infant who has experienced a history of contingent responsiveness from a primary caregiver will develop a model of that caregiver as available, and expect such behavior. That child will also develop a complementary sense of self that he or she is worthy of responsive care. On the other hand, an infant who has experienced unresponsive care will develop a very different model of the relationship, expecting the caregiver to be unavailable. Such an infant is expected to develop a sense of self as unworthy of responsive care.

More generally, these internalized working models are seen as providing a framework for future interactions, resulting in a repetition of the early attachment relationship (Bowlby, 1973; Sroufe, 1990). The child seeks, responds, and interprets events based on the model that he or she has developed during infancy, and that model is adapted based on new experiences with the environment. A child who has developed a secure attachment relationship is likely to expect positive interactions with teachers, and thus elicit responsive care reminiscent of his or her caregiver's behavior. An insecure child, expecting rejection, will approach relationships with increased hostility, ultimately resulting in further experiences with rejection.

Support for these theoretical expectations comes from a number of studies. For example, the quality of the child's early attachment relationship with the mother has been found to affect the child's later functioning in social interactions with teachers and peers. Thus, early proximal processes produce proximal processes throughout development. Children judged as securely attached in infancy have been shown to approach unfamiliar peers and adults more positively and with greater acceptance (Booth, Rose-Krasnor, McKinnon, & Rubin, 1994; Main & Weston, 1981; Pastor, 1981). Furthermore, they have more positive relationships with peers and teachers in preschool (Sroufe, Fox, & Pancake, 1983; Turner, 1991). Because secure children have developed a positive internal working model in the context of a secure attachment relationship with a primary caregiver, these children expect and elicit positive interactions with other social partners.

This body of attachment theory and research has important implications for the bioecological model. Its relevance is most succinctly conveyed in operational terms, by assessing quality of attachment in different positions in the research design; for example, as an outcome at Time 2 of proximal processes at Time 1, or, alternatively, in the form of strong versus weak contextual dyads at Time 1 moderating the power of a proximal process to influence developmental outcomes at Time 2. The latter design fits a long-standing proposition derived from the bioecological model, which reads as follows:

> In order to develop—intellectually, emotionally, socially, and morally—a child requires, for all of them, the same thing: participation in progressively more complex reciprocal activity, on a regular basis over extended periods of time with one or more other persons with whom the child develops a strong, mutual, irrational attachment,[13] and who are committed to that child's development, preferably for life. (Bronfenbrenner, 1989c, p. 5)

A second proposition goes a step further:

> The establishment and maintenance of patterns of progressively more complex interaction and emotional attachment between caregiver and child depend in substantial degree on the availability and active involvement of another adult who assists, encourages, spells off, gives status to, and expresses admiration and affection for the person caring for and engaging in joint activity with the child. (Bronfenbrenner, 1989c, p. 11)

Taken together, the foregoing propositions present an important qualifier to the general finding that children growing up in single-parent families are at greater developmental risk than those in two-parent structures. What counts most is the quality of the relationships and activities that take place in the family, and situations can occur in which, from this perspective, quality overrides quantity (Hetherington & Clingempeel, 1992).

Both propositions take on added importance because their relevance may extend beyond parental ties to close relationships with other caregivers, relatives, peers, teachers, mentors, coworkers, and supervisors. The propositions may also apply beyond childhood and ado-

[13] What is meant by the term "irrational attachment"? One answer: This is the first child you try to save in a fire.

lescence to relationships in adulthood and old age. So far as we have been able to discover, these possibilities still await systematic investigation in correspondingly appropriate research designs.

BEYOND THE MICROSYSTEM

It is a basic premise of ecological systems theory that development is a function of forces emanating from multiple settings and from the relations among these settings. How can such multiple forces and their interrelations be conceptualized, and what kinds of research designs can be employed to measure their combined effects? The first stage in such an expanded model of the environment involves what in ecological systems theory is called a *mesosystem,* defined as comprising the relationships existing between two or more settings; in short, it is a system of two or more microsystems. Mesosystems and their operationalization in a research design are best conveyed through a concrete example.

Steinberg, Darling, and Fletcher (1995) reported on what they described as "an ecological journey," which was the consequence of a deliberate decision made at the outset of their research. The initial focus of investigation was on the impact of authoritative parenting on adolescents' academic achievement. They had at their disposal a range of data collected from a large multiethnic, multiclass sample encompassing several family structures. Under these circumstances, they concluded:

> [I]t made no sense at all to control for ethnicity, social class, or household composition in an attempt to isolate "pure" process. No process occurs outside of a context. And if we want to understand context, we need to take it into account, not pretend to control it away. (Steinberg et al., 1995, p. 424)

No sooner had the investigators embarked on this unconventional course than they encountered some unexpected findings. The first of these occurred not in the realm of environmental context but of developmental outcome. When they analyzed adolescents' school performance, they found that, in contrast to youth from European family backgrounds, Hispanic, African, or Asian American youth did not benefit from authoritative parenting. A first clue to this puzzle emerged when the investigators identified the values held by the different "peer crowds" (e.g., "jocks, brains, nerds, preppies, or druggies") in the nine high schools included in their sample. Their subsequent analysis revealed that "European-American youngsters from authoritative homes are more likely to belong to peer crowds that encourage academic achievement" (Steinberg et al., 1995, p. 445).

On the basis of these and related findings, Steinberg et al. (1995) formulated the following, new working hypothesis:

> There is a strong but indirect path between parenting practices and adolescent peer group affiliations . . . by fostering certain traits in their children, parents direct a child toward a particular peer group. Thus to the extent that parents can influence characteristics by which adolescents are associated by peers with a crowd, parents can "control" the type of peer group influences to which their child is exposed. . . . In essence, parents have a direct and primary impact on adolescent behavior patterns—prosocial as well as antisocial. Peer groups serve primarily to reinforce established behavior patterns or dispositions. (pp. 446–447)

But when the investigators put their new hypothesis to the test, they were confronted by yet another unexpected result:

> When we attempted to apply this model to youngsters from minority backgrounds, we were in for a shock. We found that among Black and Asian students, there was *no relation* between parenting practices and peer crowd membership. (p 447)

Once again, the researchers' "multiple context model" paved the way to solving the puzzle:

> Why was there not significant relation between parenting and peer group selection among minority youth? The answer, we discovered, is that models of peer group selection that assume an open system, in which adolescents can select into any number of groups as easily as ordering food off a restaurant menu, fail to take into account the tremendous level of ethnic segregation that characterizes the social structure of most ethnically mixed high schools in the United States. (pp. 447–448)

The authors' findings with respect to specific minority groups are of considerable interest:

> Although [African American] parents score highest on our measure of parental involvement in schooling, [Black adolescents] find it much more difficult to join a peer group that encourages the same goal. (p. 449)

By contrast:

> More often then not, Asian American students have no choice but to belong to a peer group that encourages and rewards academic excellence. . . . Asian Americans report the highest level of peer support for academic achievement. Interestingly, and in contrast to popular belief, [their] parents are the *least* involved in their youngsters' schooling. (p. 448)

The Expanding Ecological Universe

As if disappointed at not being confronted with yet another unexpected finding, Steinberg and his colleagues moved on to extend the ecological model to its next higher systems level—that of the *exosystem.* The formal definition of this environmental structure reads as follows:

> The exosystem comprises the linkages and processes taking place between two or more settings, at least one of which does not contain the developing person, but in which events occur that indirectly influence processes within the immediate setting in which the developing person lives. (Bronfenbrenner, 1993, p. 24)

The particular exosystem that Steinberg et al. (1995) undertook to investigate was "the network of families that develops through the child's peer relationships," more specifically, "the parenting practices of their peers' parents" (p. 450). The investigators' analyses led to a series of interrelated findings as shown in these two examples:

> Adolescents whose friends' parents are authoritative earn higher grades in school, spend more time on homework . . . have more positive perceptions of their academic competence, and report lower levels of delinquency and substance use.
>
> Adolescents whose parents are already more authoritative appear to benefit more from membership in a peer network with other authoritatively reared youngsters than do adolescents in similar networks, but from less authoritative homes. It appears that adolescents need certain "home advantages" in order to be able to take advantage of the social capital in their social networks. (Steinberg et al., 1995, pp. 452–453)

Presumably, even an ecological model can only be taken so far, but Steinberg and his colleagues appear to be trying to push it to its limits—their next analysis moves from the parental network of the adolescent's peers to the neighborhood's level of *social integration.* The measure of integration was based on a series of questions about parents' contact with their children's friends, participation in community and social activities, and ties to other families in the neighborhood. An analysis of the data revealed a modest effect of neighborhood integration on ado-lescent development. However, this finding was qualified in an important way that refocused attention on the key role played by family processes. In the author's words:

> When we reran these analyses separately in neighborhoods characterized by a high proportion of effective versus noneffective parents, we find that . . . social integration only benefits adolescents whose families live in neighborhoods characterized by good parenting. Social integration into a neighborhood characterized by a high proportion of bad parents has a harmful effect on adolescents' school performance and behavior. (Steinberg et al., 1995, p. 457)

A subsequent analysis revealed a second, equally critical but not surprising qualifier: "Living in a neighborhood characterized by a high degree of social integration is only beneficial to an individual adolescent if the child's family is also socially integrated" (p. 457).

Steinberg et al.'s final analysis adds psychological substance to social structure. By aggregating information on parenting practices and attitudes in a neighborhood, he and his associates were able to calculate a measure of the degree of consensus among parents in a given neighborhood. Once again, the principal finding emerging from the analysis was conditioned by a psychological reality:

> High neighborhood consensus augments the association between parenting and adolescent outcomes only when the consensus is around good parenting. . . . In other words, it is what parents agree about, not merely whether they agree, that makes the difference. (Steinberg et al., 1995, p. 458)

In this particular study, the investigators did not examine the extent to which the biopsychological characteristics of adolescents, or of their parents, influenced

developmental processes and outcomes. Today, a growing body of researchers (e.g., Plomin, Reiss, Hetherington, & Howe, 1994) claims strong evidence for the view that individual and group differences in a wide range of developmental outcomes are mainly driven by differences in genetic endowment ("Ability Testing," 1992; Plomin, 1993; Plomin & Bergeman, 1991; Plomin & McClearn, 1993; Scarr, 1992). This claim is called into question, however, by alternative explanations and evidence based on the bioecological model (see also Lerner, 1995, 2002, 2004a).

Nature-Nurture Reconceptualized: A Bioecological Interpretation

The theoretical argument is set forth in a series of hypotheses, each accompanied by a corresponding research design (Bronfenbrenner & Ceci, 1994b).

> *Hypothesis 1:* Proximal processes raise levels of effective developmental functioning, and thereby increase the proportion of individual differences attributable to actualized genetic potential for such outcomes. This means that heritability (h^2) will be higher when proximal processes are strong and lower when such processes are weak.
>
> *Hypothesis 2:* Proximal processes actualize genetic potentials both for enhancing functional competence and for reducing degrees of dysfunction. Operationally, this means that as the level of proximal process is increased, indexes of competence will rise, those of dysfunction will fall, and the value of h^2 will become greater in both instances.
>
> **1.** The power of proximal processes to actualize genetic potentials for developmental competence (as assessed by an increase in h^2) will be greater in advantaged and stable environments than in those that are disadvantaged and disorganized.
>
> **2.** The power of proximal processes to buffer genetic potentials for developmental dysfunction will be greater in disadvantaged and disorganized environments than in those that are advantaged and stable.
>
> *Hypothesis 3.* If persons are exposed over extended periods of time to settings that provide developmental resources and encourage engagement in proximal processes to a degree not experienced in the other settings in their lives, then the power of proximal processes to actualize genetic potentials for developmental competence will be greater for those living in more disadvantaged and disorganized environments.

To test the preceding hypotheses, Bronfenbrenner and Ceci (1994b) reviewed literature on genetic inheritance:

> We have been able to find no studies of genetic inheritance in contrasting environments that also contained data on proximal processes and hence would permit a direct test of the previous hypotheses. Hence, most of the available evidence is indirect.
>
> An indirect test can be carried out only when estimates of heritability are reported for the same developmental outcome in different environments. It is fortunate that there are several studies that meet this criterion. To begin with, both Scarr-Salapatek (1971) and Fischbein (1980) found support for the prediction that values of h^2 for IQ would be greater in higher than in lower social class groups. Subsequently, a group of Norwegian investigators (Sundet, Tambs, Magnus, & Berg, 1988) undertook to clarify a series of earlier findings regarding secular trends over recent decades in heritability for measures of cognitive functioning. Using IQ scores as outcome data, the investigators found some support for results of a previous study of educational attainment (Heath et al., 1985) that had shown an increase in h^2 for twins born after 1940. The trend for their mental test data, however, was considerably weaker. The authors offered the following interpretation of the observed similarity and contrast:
>
> > This is probably due at least partly to the fact that the Norwegian government in the postwar period has offered loans to young people seeking education, thus enabling youngsters with poor parents to attend higher education. Such factors, together with a more positive attitude toward education among poor people, would tend to decrease the effect of familial environments and maximize genetic potential. (Sundet et al., 1988, p. 58)[14]

[14] Sundet (personal communication, March 17, 1993) reported that, in response to a preliminary version of the article by Bronfenbrenner and Ceci (1994), he and his colleagues undertook a preliminary analysis that yielded the following results: "For twins with mothers having the least education, the correlation between identical twins is .80, whereas the correlation for fraternal twins is .47. For the twins having mothers with more education, these correlations are .82 and .39, respectively. As you will see, this yields a heritability estimate of .66 for the first group, whereas it is .86 for the second group. If I understand your [Hypothesis 2] correctly, this is in accordance with your predictions. However, the difference between the two DZ [dizygotic] correlations does not seem to reach statistical significance, although it is quite near."

> There are also a number of investigations that permit an indirect test of the hypothesized reverse pattern when the outcome is one of developmental dysfunction. For example, Jenkins and Smith (1990) found that the positive effect of a good mother-child relationship on children's problem behavior was stronger in a troubled marriage than in a harmonious one. More generally, in a recent review, Rutter and Rutter (1992) concluded that the impact of protective factors in buffering developmental disorders is greater in "circumstances of risk." (p. 56)

This concludes Process, Person, and Context as shapers of development, it is time to turn to *Time*.

TIME IN THE BIOECOLOGICAL MODEL: MICRO-, MESO-, AND MACROCHRONOLOGICAL SYSTEMS

Time, a defining property of the bioecological paradigm, appears more than once in the model's multidimensional structure. Indeed, its first appearance, in the second sentence of Proposition I, may have well gone unnoticed. Following the definition of proximal processes as involving progressively more complex reciprocal interaction, the Proposition stipulates that to be effective, the interaction must occur on a fairly regular basis.

Why this proviso? A first indication appears in the findings from Wachs's research (1979) on the features of the environment most frequently and strongly associated with individual differences in cognitive competence. Prominent among them were a physically responsive environment, presence of sheltered areas, instability and unpredictability of events, the "degree to which the physical set-up of the home permits exploration," low level of noise and confusion, and "the degree of temporal regularity" (p. 30). As noted earlier, it follows from such findings that proximal processes cannot function effectively in environments that are unstable and unpredictable across space and time.

It also follows that the cumulative effects at this *mesosystem* level are likely to jeopardize the course of human development. One reason for expecting such an escalating effect is that, at this next higher level of environmental structure, similarly disruptive characteristics of interconnected microsystems tend to reinforce each other.

The most informative research evidence bearing on this issue comes from a longitudinal study conducted by the Finnish psychologist, Lea Pulkkinen (1983). Beginning when participating children were 8 years of age, she investigated the effect of environmental stability and change on the development of children through adolescence and young adulthood, The "steadiness" versus "unsteadiness" of family living conditions was measured by the frequency of such events as the following: the number of family moves, changes in day care or school arrangements, extent of family absence, incidence of divorce and remarriage, and altered conditions of maternal employment. Greater instability in the family environment was associated with greater submissiveness, aggressiveness, anxiety, and social problems among children in later childhood and adolescence, leading to higher risks of violence and criminal behavior in early adulthood (Pulkkinen, 1983; Pulkkinen & Saastamoinen, 1986). Moreover, the factor of stability of family living conditions appeared to be a stronger determinant of subsequent development than was the family's socioeconomic status.

Analogous findings for the contemporary U.S. scene were obtained by Moorehouse (1986) in a study of how stability versus change over time in the mother's work status during the child's preschool years affected patterns of mother-child communication, and how these patterns in turn influenced the child's achievement and social behavior in the 1st year of school. A key analysis involved a comparison between mothers who had maintained the same employment status over the period of the study, and those who had changed in either direction: that is, to working more hours, fewer hours, or none at all. The results revealed that significant effects of work status were pronounced only in the group that had changed their working status. Although the disruptive impact was greatest among those mothers who had moved into full-time employment, it was still present even for those who had reduced their working hours or had left the labor force. Moorehouse concluded that "instability, on the whole, is associated with less favorable school outcomes than stability" (p. 103).

In the framework of the discovery mode, we are once again at a point where a series of findings from different studies suggests yet another tentative formulation. The corollary follows:

> The degree of stability, consistency, and predictability over time in any element of the systems constituting the ecology of human development is critical for the effective operation of the system in question. Extremes either of disorganization or rigidity in structure or function represent danger signs for potential psychological growth, with some intermediate degree of system flexibility constituting the optimal condition for human development. In re-

search design, this proposition points to the importance of assessing the degree of stability versus instability, with respect to characteristics of Process, Person, and Context, at each level of the ecological system.

This formulation also applies at the macrolevel to the dimension of Time, both during the individual's life course, and through the historical period in which the person has lived (see Proposition II). It was this observation that gave rise to the first systematic formulation of what was to become the ecological model of human development. The formulation appeared almost 4 decades ago in an article entitled "Socialization and Social Class through Time and Space" (Bronfenbrenner, 1958). In that article, Bronfenbrenner reanalyzed what appeared to be contradictory findings on social class differences in patterns and outcomes of child rearing. The analysis reveals that when the obtained results were reorganized by the years in which the data were collected, the contradictory findings disappeared. Instead, there was a systematic gradual change over the period just after World War II until the late 1950s, with middle-class parents moving away from originally more authoritarian patterns toward greater permissiveness and lower-class families going in the opposite direction. Changes in patterns of child rearing over historical time and their effects on development have been recurring themes in Bronfenbrenner's work beginning in the late 1950s (1958) and continuing up to the present (Bronfenbrenner, 1970, 1975, 1990, 1994; Bronfenbrenner & Crouter 1982; Bronfenbrenner et al., 1996); but in terms of theoretical and empirical contributions this work pales in comparison with that of Elder, beginning with his classic study, *Children of the Great Depression* (Elder, 1974; see also Elder & Shanahan, Chapter 12, this *Handbook,* this volume).

As Bronfenbrenner has noted, Elder's work on life-course development played a significant role in the formulation of the original ecological model (Bronfenbrenner, 1979a, see especially pp. 266–285 and 273–285), and has exerted even greater influence on the model's subsequent evolution in this same domain (Bronfenbrenner, 1986a, 1986b, 1989, 1993, 1995).

Because Elder's contributions deservedly receive extended coverage in Chapter 12, this *Handbook,* this volume, we confine ourselves to the four defining principles of life-course theory as presented in a recent formulation (Elder, 1998),[15] along with implications for corresponding research designs, and examples of relevant research findings.

The first principle is that of *historical time and place,* defined by Elder as follows: *The life course of individuals is embedded in and shaped by the historical times and events they experience over their life time.*

History is exploited as an experiment of nature. The corresponding research design compares groups similar in other respects who have been exposed, versus not exposed, to a particular historical event; for example, Elder's studies of the Great Depression (Elder, 1974; also see Elder, 1998; Elder & Shanahan, Chapter 12, this *Handbook,* this volume); military service and actual combat in World War II and Korea (Elder, 1986; Elder, Shanahan, & Clipp, 1994); the Iowa farm crisis (Conger & Elder, 1994; Elder, King, & Conger, 1996); urban inequality (Elder, Eccles, Ardelt, & Lord, 1995); and, Elder's most recent work, research on youth sent to the countryside during China's cultural revolution (Elder, Wu, & Jihui, 1993).

The second principle, called *timing in lives,* states that *the developmental impact of a succession of life transitions or events is contingent on when they occur in a person's life.*

Here an appropriate research design is one that compares early versus late arrivals at a particular transition with respect to their subsequent life course. For example, Elder et al. (1994) reanalyzed follow-up data on subjects from Terman's 1925 classic *Genetic Studies of Genius* (all subjects with very high IQs) and were able to show marked differences in subsequent adult development depending on early versus late entrance into military service during wartime. Some of the costs of late entry include:

- A higher risk of divorce and separation
- A work life of disappointment and loss of lifetime income
- An accelerated decline of physical health, most notably after the age of 50

On the opposite side:

- For many men, and especially those who entered at an early age, military service was a recasting experience. It provided a bridge to greater opportunity and an impetus for developmental growth up to the middle years.

[15] For an earlier, but more comprehensive account, see Elder's Chapter 16, this *Handbook,* this volume.

One is reminded of Brutus's fateful choice in response to Cassius's urgings:

> There is a tide in the affairs of men
> Which, taken at the flood, leads on to fortune;
> Omitted, all the voyage of their life
> Is bound in shallows and in miseries.
>
> —Shakespeare, *Julius Caesar* (IV. iii. 218–221)

The third principle, *linked lives,* asserts that *lives are lived interdependently and social and historical influences are expressed through this network of shared relationships.*

The basic research design corresponding to this principle involves examining the differential impact of historical events and role transitions on different members of the same family experiencing these same events and transitions. In a study of mother-daughter dyads in the broader historical context of the societal changes in gender roles that have taken place since World War II, Moen and Erickson (1995) offered the following concluding comment, on the basis of their statistical analysis of data across two generations:

> Conventional mothers embracing traditional gender roles may find themselves with daughters who are in the vanguard of the women's movement. Some mothers may even push their daughters to achieve what was impossible for themselves. The fact that mothers and daughters experience historical events and social changes from different vantage points means that their lives are differentially touched by them and that their perspectives may well diverge. (p. 180)

Environmental changes across historical time can produce significant developmental changes in either direction. On the one hand, they can disrupt the timing and duration of normative transitions during the life course, thus interrupting the sequence of learning experiences that are essential for meeting societal expectations as one gets older. On the other hand, they can offer to the person new, at once more stable and more challenging opportunities that enhance psychological growth or even reverse a previously downward course (e.g., Elder's 1974 studies of effects of military enlistment on young men from poverty backgrounds).

FROM RESEARCH TO REALITY

The fourth and last of Elder's principles of life course development he calls *human agency.* It states that *"individuals construct their own life course through choices and actions they take within the opportunities and constraints of history and social circumstances."* A striking example is his finding that the young men most likely to volunteer early for service in World War II were often those who came from the most deprived circumstances, but then benefited the most from the opportunities of training and experience that the military provided. Nevertheless, he cautions that "Not even great talent and industry can ensure life success over adversity without opportunities" (Elder, 1997).

Finally, to Elder's four principles, we add a fifth, which in effect reverses the direction of his very first principle regarding the importance of historical changes in shaping the course of human development. Simply stated, the fifth principle asserts that changes over time in the four defining properties of the bioecological model are not only products but also *producers* of historical change. To spell out the argument and evidence on which the principle is based: Periodically, since the late 1950s, Bronfenbrenner, together with colleagues, has been publishing articles documenting changes over time in three domains: child-rearing practices, the relation of these practices to child outcomes, and in family demographics reported annually in the U.S. Census and other government publications.

One report of these analyses appears in a volume entitled: *The State of Americans: This Generation and the Next* (Bronfenbrenner et al., 1996). The book consists of almost 300 pages and 150 graphs, but, for present purposes, the principal findings can be summarized in 10 points shown in Table 14.1. Considered as a whole, the findings constitute the basis for our proposed addition to Elder's four principles.

To illustrate, although proximal processes function as the engines of development, the energy that drives them comes from deeper sources that take us back to the experiential world of Proposition I (Bronfenbrenner et al., 1996; Bronfenbrenner & Evans, 2000; Bronfenbrenner & Morris, 1998). Both subjective and objective forces exert an especially strong influence on development during the formative years (from early infancy to young adulthood). A substantial body of research over the past century indicates that, 2 or 3 decades ago,

TABLE 14.1 Summary of Selected Findings

1. Annual surveys over the past two decades reveal growing cynicism and disillusionment among American youth, reflected in a loss of faith in others, in their government, in the basic institutions of their society, and in themselves.
2. In the United States far greater percentages of youth and women are victims of homicide, with rates more than 10 times as high as those for any other developed country.
3. The young are not only likely to be the victims of murder, they are also more likely to commit it. Youth and young adults (ages 18–25) now account for the majority of those arrested for homicide.
4. The percentage of Americans in prison is four times higher than in other developed countries, and the number is rising rapidly.
5. Despite recent gains made by youth from Black families. American high school students are still far behind those from other developed countries in academic achievement. This includes the top 10% of students in each nation. The trend already threatens our productivity and capacity to compete economically in the future.
6. The United States stands in first place in the percentage of children growing up in single-parent families, which now includes over a quarter of all America's children under 6 years of age.
7. Families with children under 6, particularly single-parent mothers, are those who most seek—and desperately need—a job. But they also have the highest unemployment rates. The proportion of Black mothers working full time is much higher than for white mothers (in 1994, 76% vs. 29%).
8. The percentage of U.S. children living in poverty today is twice as high as that for any other developed nation.
9. Among developed nations, the incomes of rich versus poor families are farthest apart in the United States. We are rapidly becoming a two-class society.
10. Two-thirds of children in poverty live in families with working adult. Less than one-third of poor families with a young child rely solely on welfare.

We are indebted to our colleagues who, as coauthors of chapters of the volume *The State of Americans: This Generation and the Next,* provided the findings summarized in Table 14.1. Besides ourselves, they include the following: Steven J. Ceci, Helen Hembrooke, Peter McClelland, Phyllis Moen, Elaine Wethington, and Tara L. White. *Source:* From *The State of Americans: This Generation and the Next,* by U. Bronfenbrenner, P. McClelland, E. Wethington, P. Moen, and S. J. Ceci, 1996, New York: Free Press.

these forces lay mainly in the family, with parents acting as the principal caregivers and sources of emotional support for their children, and with other adult family members living in the home being next in line. To a lesser extent, other relatives, family friends, and neighbors also functioned in this role.

However, there has been a marked change in this pattern over the past 4 decades. Parents, and other adult family members as well, have been spending increasing amounts of time commuting to and working at full-time jobs (in which overtime is increasingly required or expected). The nature of this trend and its relevance for human development are conveyed in the idea that to develop—intellectually, emotionally, socially, and morally—a child requires, for all of these, the same thing: participation in progressively more complex activities, on a regular basis over an extended period of time in the child's life, with one or more persons with whom the child develops a strong, mutual emotional attachment, and who are committed to the child's well-being and development, preferably for life (Bronfenbrenner & Evans, 2000; Bronfenbrenner & Morris, 1998; also see Lerner, 2004b). The establishment of a strong mutual emotional attachment leads to internalization of the parent's activities and expressed feelings of affection. Such mutual ties motivate the child's interest and engagement in related activities in the immediate physical, social, and—in due course—symbolic environment that invite exploration, manipulation, elaboration, and imagination.

The establishment and maintenance of patterns of progressively more complex interaction and emotional attachment between parent and child depend, to a substantial degree, on the availability and involvement of another adult, a third party, who assists, encourages, spells off, gives status to, and expresses admiration and affection for the person caring for and engaging in joint activity with the child. It also helps, but is not absolutely essential, that the third party be of the opposite sex from that of the other person caring for the child, because this is likely to expose and involve the child in a greater variety of developmentally instigative activities and experiences (Bronfenbrenner et al., 1996). Where this is an attachment to two or more parent figures, each can serve as a third party to the other.

The research evidence for this idea comes mainly by default. It was produced by demographic data documenting a rapid rise in the proportion of single-parent households. The trend began in the 1980s, and then continued at an even faster rate through most of the 1990s. The overwhelming majority of such homes were those in which the father was absent and the mother bore primary responsibility for the upbringing of the children.

A large number of investigations of developmental processes and outcomes in families of this kind have since been conducted across a range of cultural and social class groups. The findings lead to two complementary conclusions:

1. Even in families living in favorable socioeconomic circumstances, children of single-parent mothers, or of fathers, for whom no other person is acting reliably in a third party role are at greater risk for experiencing one or more of the following developmental problems: hyperactivity or withdrawal, lack of attentiveness, difficulty in deferring gratification, poor academic achievement, school misbehavior, and frequent absenteeism.
2. At a more serious level, there is the so-called teenage syndrome of behaviors that tend to be associated together: dropping out of school; involvement in socially alienated or destructive peer groups; smoking, drinking, frequent sexual experience: adolescent pregnancy; a cynical attitude toward work; and in the more extreme cases—drugs, suicide, vandalism, violence, and criminal acts. Most of these effects are more pronounced for boys than for girls (Bronfenbrenner et al., 1996).

Not all single-parent families, however, exhibited these disturbed relationships and their disruptive effects on children's development. Systematic studies of the exceptions have identified what may be described as a general immunizing factor. For example, children of single parents were less likely to experience developmental problems especially in families in which the mother (or father) received strong support from other adults living in the home. Also helpful were nearby relatives, friends, neighbors, members of religious groups, and, when available, staff members of family support and child care programs. What mattered most was not only the attention given to the child—important as this was—but also the assistance provided to the single parent or by others serving in the supportive roles previously noted. It would seem that, in the family dance, it takes three to tango.

But dancing is not the whole story. By the 1980s, theory and research in the ecology of human development had documented an accelerating trend toward greater permissiveness in styles of child rearing in U.S. families. At the same time, successive scientific investigations had revealed progressively greater developmental advantage for strategies that placed increased emphasis on parental discipline and demand. The interpretation that emerged from analyses of the available data suggested that widespread application of these research findings would serve as an effective response to the developmentally disruptive changes taking place in contemporary society.

At a more general level, the research findings reveal growing chaos in the lives of families, in child care settings, schools, peer groups, youth programs, neighborhoods, workplaces, and other everyday environments in which human beings live their lives. Such chaos interrupts and undermines the formation and stability of relationships and activities that are essential for psychological growth. Moreover, many of the conditions leading to that chaos are the often unforeseen products of policy decisions made both in the private and in the public sector. Today, in both of these arenas, we are considering profound economic and social changes, some of which threaten to raise the degree of chaos to even higher and less psychologically (and biologically) tolerable levels. The most likely and earliest observed consequences of such a rise are still higher levels of youth crime and violence, teenage pregnancy and single parenthood,[16] as well as reduced school achievement, and, ultimately, a decline in the quality of our nation's human capital (Bronfenbrenner et al., 1996).

Thus, we have arrived at a point where the concerns of basic developmental science are converging with the most critical problems we face as a nation. That convergence confronts us, both as scientists and as citizens, with new challenges and opportunities.

THE BIOECOLOGICAL MODEL: A DEVELOPMENTAL ASSESSMENT

In this chapter, we have undertaken two challenging tasks, each an example of science in the discovery mode with developmental science as its subject matter. The first was to describe a next stage in the evolution of an ecological theory of human development, first introduced more than 20 years ago. The second task was unintended, but nevertheless begun, for this chapter also documents early steps in the design of a third-generation model.

As one of those early steps, we found it necessary to spell out the requirements for conducting developmental research in the discovery mode. To our knowledge, this is a first effort to do so systematically, and may there-

[16] Once again we emphasize that the relationships and activities in which parent and child are involved can override the influence of purely demographic factors such as mother's age and family structure (p. 1015).

fore receive—and deserve—more criticism than any other section in the chapter. But at least readers will know what criteria we were trying to meet and will have a basis for assessing the validity of the proposed strategy as reflected in the more differentiated theoretical and operational models emerging from the successive confrontations between theory and data.

Among the more promising products of this effort is the demonstration of the power of *proximal processes* as the engines of development, and their systematic variation as a function of the characteristics of both *Person* and *Context*. We have also presented evidence that, in accord with specifications of the bioecological model, different pathways through space and time lead to different outcomes. In this regard, distinctions between two types of outcome appear especially relevant: (1) between outcomes of competence versus dysfunction and (2) between activities focusing primarily on interpersonal relationships versus objects and symbols. A third potentially productive contrast speaks to the question of who develops and who doesn't by identifying dispositional characteristics of the Person that are *developmentally generative* versus *developmentally disruptive*. Two additional Person characteristics deemed consequential for development are also distinguished and illustrated. The first are *resources* in terms of ability and acquired knowledge and skill. The second are *demand* characteristics that attract or encourage progressively more complex interaction. An analogous taxonomy is proposed for the quality of environments, accompanied by illustrations of their corresponding differential effects on proximal processes and outcomes. In each instance, the evolving tentative hypotheses derived from successively more differentiated formulations based on the bioecological model are accompanied by their operational analogs in terms of corresponding research designs and the findings generated by them.

The discovery process points also to the scientific need and benefit of including, in research designs for the same subjects, two different developmental outcomes that complement each other. For theoretical reasons deriving from the bioecological model, likely to be even more productive would be the inclusion in the same research design of two different, but theoretically complementary proximal processes.

Finally, in our view, the most scientifically promising formulation emerging from the discovery process documented in this chapter is easily stated, but it is also one that presents the greatest theoretical challenge:

> The four defining components of the bioecological model should be theoretically related to each other and to the developmental outcomes under investigation. This means that the choice of variables to represent each of the defining properties should be based on explicit assumptions about their presumed interrelations.

This may seem a disappointing conclusion for so long an exposition. Perhaps, even more in developmental science than in other fields, the pathways to discovery are not easy to find. The trails are not marked, there are many dead ends, the journey is far longer than expected, and at the end, little may be there. What counts is what one learns along the way and passes on to future explorers of the uncharted terrain. Here are some final ideas for those of you whose work will fill the future landscape of developmental science. At this still early moment in the twenty-first century, we are left with a troubling question: From the perspective of the bioecological model, what is the prospect for the future development of our species? The answer to that question lies with the willingness of the United States and other economically developed countries to heed the emerging lessons of developmental science. At the moment, it is difficult to know what the answer will be. The future could go either way. Given this alternative, it becomes the responsibility of developmental science to communicate such knowledge as we possess, and to do so in words that can still find an echo. Here is a first draft:

> In the United States it is now possible for a youth, female as well as male, to graduate from high school, or university, without ever caring for a baby; without ever looking after someone who was ill, old, or lonely; or without comforting or assisting another human being who really needed help. The developmental consequences of such a deprivation of human experience have not as yet been scientifically researched. But the possible social implications are obvious, for—sooner or later, and usually sooner—all of us suffer illness, loneliness, and the need for help, comfort, and companionship. No society can long sustain itself unless its members have learned the sensitivities, motivations, and skills involved in assisting and caring for other human beings.

REFERENCES

Ability testing [Special section]. (1992). *Psychological Science, 3,* 266–278.

Ainsworth, M. D., Blehar, M. C., Waters, I., & Wall, S. (1978). *Patterns of attachment: A Psychological Study of the Strange Situation.* Hillsdale, NJ: Erlbaum.

Allport, G. W. (1937). *Personality: A psychosocial interpretation.* New York: Holt.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavior change. *Psychological Review, 84,* 191–215.

Bandura, A. (1982). Self-efficacy mechanism in human agency. *American Psychologist, 37,* 122–147.

Beckwith, L., & Cohen, S. E. (1984). Home environment and cognitive competence in preterm children during the first 5 years. In Allen W. Gottfried (Ed.), *Home environment and early cognitive development* (pp. 235–271). New York: Academic Press.

Beckwith, L., Rodning, C., & Cohen, S. (1992). Preterm children at early adolescence and continuity and discontinuity in maternal responsiveness from infancy. *Child Development, 63,* 1198–1208.

Bergman, L. R., Cairns, R. B., Nilsson, L.-G., & Nysted, L. (Eds.). (2000). *Developmental science and the holistic approach.* Mahwah. NJ: Erlbaum.

Block, J., Block, J. H., & Keyes, S. (1988). Longitudinally foretelling drug usage in adolescence: Early childhood personality and environmental precursors. *Child Development, 59,* 336–355.

Block, J. H., & Block, J. (1980). The role of ego-control and ego-resiliency in the organization of behavior. In W. A. Collins (Ed.), *Minnesota Symposia on Child Psychology* (Vol. 13, pp. 39–101). Hillsdale, NJ: Erlbaum.

Booth, C. L., Rose-Krasnor, L., McKinnon, J., & Rubin, K. H. (1994). Predicting social adjustment in middle childhood: The role of preschool attachment security and maternal style. *Social Development, 3*(3), 189–204.

Bowlby, J. (1969). *Attachment and loss: Vol. 1. Attachment.* New York: Basic Books.

Bowlby, J. (1973). *Attachment and loss: Vol. 2. Separation.* New York: Basic Books.

Bronfenbrenner, U. (1958). Socialization and social class through time and space. In E. E. Maccoby, T. M. Newcomb, & E. L. Hartley (Eds.), *Readings in social psychology* (pp. 400–425). New York: Holt, Rinehart and Winston.

Bronfenbrenner, U. (1970). *Children and parents* (Report of Forum 15, pp. 241–255). Washington, DC: U.S. Government Printing Office.

Bronfenbrenner, U. (1974). Developmental research, public policy, and the ecology of childhood. *Child Development, 45,* 1–5.

Bronfenbrenner, U. (1975). Reality and research in the ecology of human development. *Proceedings of the American Philosophical Society, 119,* 439–469.

Bronfenbrenner, U. (1977a). Lewian space and ecological substance. *Journal of Social Issues, 33,* 199–212.

Bronfenbrenner, U. (1977b). Toward an experimental ecology of human development. *American Psychologist, 32,* 513–531.

Bronfenbrenner, U. (1979a). Contexts of child rearing. *American Psychologist, 34,* 844–858.

Bronfenbrenner, U. (1979b). *The ecology of human development: Experiments by nature and design.* Cambridge, MA: Harvard University Press.

Bronfenbrenner, U. (1981). *Die Oekologie der menschlichen Entwicklung.* Stuttgart, Germany: Klett-Cotta.

Bronfenbrenner, U. (1986a, July 23). *A generation in jeopardy: America's hidden family policy.* Testimony presented to the committee on Rules and Administration, Washington, DC.

Bronfenbrenner, U. (1986b). Recent advances in research on the ecology of human development. In R. K. Silbereisen, K. Eyferth, & G. Rudinger (Eds.), *Development as action in context: Problem behavior and normal youth development* (pp. 286–309). New York: Springer-Verlag.

Bronfenbrenner, U. (1989a). Ecological systems theory. In R. Vasta (Ed.), *Annals of child development: Six theories of child development-Revised formulations and current issues* (pp. 187–249). London: JAI Press.

Bronfenbrenner, U. (1989b). The ecology of the family as a context for human development: Research perspectives. *Developmental Psychology, 22,* 723–742.

Bronfenbrenner, U. (1989c). *Who cares for children?* Paris: United Nations Educational, Scientific and Cultural Organization.

Bronfenbrenner, U. (1990). Oekologische sozialisationsforschung. In L. Kurse, C.-F. Graumann, & E.-D. Lantermann (Eds.), *Oekologische psychologie: Ein handbuch in schlusselbegriffen* (pp. 76–79). Munich, Germany: Psychologie Verlags Union.

Bronfenbrenner, U. (1992). Child care in the Anglo-Saxon mode. In M. E. Lamb, K. J. Sternberg, C. P. Hwang, & A. G. Broberg (Eds.), *Child care in context* (pp. 281–291). Hillsdale, NJ: Erlbaum.

Bronfenbrenner, U. (1993). The ecology of cognitive development: Research models and fugitive findings. In R. H. Wozniak & K. Fischer (Eds.), *Scientific environments* (pp. 3–44). Hillsdale, NJ: Erlbaum.

Bronfenbrenner, U. (1994). Ecological models of human development. In T. Husen & T. N. Postlethwaite (Eds.), *International encyclopedia of education* (2nd ed., Vol. 3, pp. 1643–1647). Oxford, England: Pergamon Press/Elsevier Science.

Bronfenbrenner, U. (1995). Developmental ecology through space and time: A future perspective. In P. Moen, G. H. Elder Jr., & K. Lüscher (Eds.), *Examining lives in context: Perspectives on the ecology of human development* (pp. 619–648). Washington, DC: American Psychological Association.

Bronfenbrenner, U. (2005). *Making human beings human.* Thousand Oaks, CA: Sage.

Bronfenbrenner, U., & Ceci, S. J. (1993). Heredity, environment and the question "How?": A new theoretical perspective for the 1990s. In R. Plomin & G. E. McClearn (Eds.), *Nature, nurture, and psychology* (pp. 313–324). Washington, DC: American Psychological Association.

Bronfenbrenner, U., & Ceci, S. J. (1994a). Nature-nurture reconceptualized: A bioecological model. *Psychological Review, 101,* 568–586.

Bronfenbrenner, U., & Ceci, S. J. (1994b). *"The Bell Curve": Are today's "New Interpreters" espousing yesterday's science?* Unpublished manuscript, Cornell University, Department of Human Development and Family Studies, Ithaca, NY.

Bronfenbrenner, U., & Crouter, A. C. (1982). Work and family through time and space. In S. Kamerman & C. D. Hayes (Eds.), *Children in a changing world* (pp. 39–83). Washington, DC: National Academy Press.

Bronfenbrenner, U., & Crouter, A. C. (1983). The evolution of environmental models in developmental research. In W. Kessen (Series Ed.) & P. H. Mussen (Vol. Ed.), *Handbook of child psychology: Vol. 1. History, theory, and methods* (4th ed., pp. 357–414). New York: Wiley.

Bronfenbrenner U., & Evans, G. W. (2000). Developmental science in the 21st century: Emerging questions, theoretical models, re-

search designs, and empirical findings. *Social Development, 9*(1), 15–25.

Bronfenbrenner, U., McClelland, P., Wethington, E., Moen, P., & Ceci, S. J. (1996). *The state of Americans: This generation and the next.* New York: Free Press.

Bronfenbrenner U., & Morris, P. A. (1998). The ecology of developmental processes. In R. M. Lerner (Ed.), *Handbook of Child Psychology* (5th ed., Vol. 1, pp. 993–1028). New York: Wiley.

Bronfenbrenner, U., & Neville, P. R. (1994). America's children and families: An international perspective. In S. L. Kagan & B. Weissbourd (Eds.), *Putting families first* (pp. 3–27). San Francisco: Jossey-Bass.

Cairns, R. B. (1970). Towards a unified science of development. *Contemporary Psychology, 15,* 214–215.

Cairns, R. B., & Cairns, B. D. (1994). *Lifelines and risks: Pathways to youth in our time.* Cambridge, England: Cambridge University Press.

Cohen, S. E., & Beckwith, L. (1979). Preterm infant interaction with the caregiver in the first year of life and competence at age two. *Child Development, 50,* 767–776.

Cohen, S. E., Beckwith, L., & Parmelee, A. H. (1978). Receptive language development in preterm children as related to caregiver-child interaction. *Pediatrics, 61,* 16–20.

Cohen, S. E., & Parmelee, A. H. (1983). Prediction of 5-year Stanford-Binet scores in preterm infants. *Child Development, 54,* 1242–1253.

Cohen, S. E., Parmelee, A. H., Beckwith, L., & Sigman, M. (1986). *Developmental and Behavioral Pediatrics, 7,* 102–110.

Cole, M. (1995). Culture and cognitive development: From cross-cultural research to creating systems of cultural mediation. *Culture and Psychology, 1,* 25–54.

Conger, R. D., & Elder, G. H., Jr. (1994). *Families in troubled times: Adapting to change in rural America.* Chicago: Aldine de Gruyter.

Connolly, J. A., & Doyle, A. (1984). Relation of social fantasy play to social competence in preschoolers. *Developmental Psychology, 20,* 797–806.

Drillien, C. M. (1957). The social and economic factors affecting the incidence of premature birth. *Journal of Obstetrical Gynecology, British Empire, 64,* 161–184.

Drillien, C. M. (1964). *Growth and development of the prematurely born infant.* Edinburgh, Scotland: Livingstone.

Elder, G. H., Jr. (1974). *Children of the great depression.* Chicago: University of Chicago Press.

Elder, G. H., Jr. (1986). Military times and turning points in men's lives. *Developmental Psychology, 22,* 233–245.

Elder, G. H., Jr. (1998). Life course and development. In W. Damon (Editor-in-Chief) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 1–24). New York: Wiley.

Elder, G. H., Jr., Eccles, J. S., Ardelt, M., & Lord, S. (1995). Inner city parents under economic pressure: Perspectives on the strategies of parenting. *Journal of Marriage and the Family, 57,* 771–784.

Elder, G. H., Jr., King, V., & Conger, R. D. (1996). Intergenerational continuity and changes in rural lives: Historical and developmental insights. *International Journal of Behavioral Development, 10,* 439–466.

Elder, G. H., Jr., Shanahan, M. J., & Clipp, E. C. (1994). When war comes to men's lives: Life course patterns in family, work, and health. *Psychology and Aging, 9,* 5–16.

Elder, G. H., Jr., Van Nguyen, T. V., & Caspi, A. (1985). Linking family hardship to children's lives. *Child Development, 56,* 361–375.

Elder, G. H., Jr., Wu, W., & Jihui, Y. (1993). *State-initiated change and the life course in Shanghai, China* (Unpublished project report). Chapel Hill, NC: Carolina Population Center.

Fischbein, S. (1980). IQ and social class. *Intelligence, 4,* 51–63.

Garmezy, N., & Rutter M. (1983). *Stress, coping, and development in children.* New York: McGraw-Hill.

Heath, A. C., Berg, K., Eaves, L. J., Solaas, M. H., Corey, L. A., Sundet, J., et al. (1985). Educational policy and the heritability of educational attainment. *Nature, 314,* 734–736.

Hetherington, E. M., & Clingempeel, W. G. (1992). Coping with marital transitions. *Monographs of the Society for Research in Child Development, 57*(2/3).

Jenkins, J. M., & Smith, M. A. (1990). Factors protecting children living in disharmonious homes: Maternal reports. *Journal of the American Academy of Child and Adolescent Psychiatry, 29,* 60–69.

Kohn, M. L., & Slomczynski, K. M. (1990). *Social structure and self-direction: A comparative analysis of the United States and Poland.* Oxford, England: Basil Blackwell.

Langer, E. J., & Rodin, J. (1976). The effects of choice and enhanced personal responsibility for the aged: A field experiment in an institutional setting. *Journal of Personality and Social Psychology, 34,* 191–198.

Lerner, R. M. (1982). Children and adolescents as producers of their own development. *Developmental Review, 2,* 342–370.

Lerner, R. M. (1995). The limits of biological influence: Behavioral genetics as the emperor's new clothes [Review of the book *The limits of family influence*]. *Psychological Inquiry, 6,* 145–156.

Lerner, R. M. (2002). *Concepts and theories of human development* (3rd ed.). Mahwah, NJ: Erlbaum.

Lerner, R. M. (2004a). Genes and the promotion of positive human development: Hereditarian versus developmental systems perspectives. In C. Garcia Coll, E. Bearer, & R. M. Lerner (Eds.), *Nature and nurture: The complex interplay of genetic and environmental influences on human behavior and development* (pp. 1–33). Mahwah, NJ: Erlbaum.

Lerner, R. M. (2004b). *Liberty: Thriving and civic engagement among America's youth.* Thousand Oaks, CA: Sage.

Lerner, R. M., & Busch-Rossnagel, N. A. (Eds.). (1981). *Individual as producers of their development: A life-span perspective.* New York: Academic Press.

MacDonald, K., & Parke, R. D. (1984). Bridging the gap: Parent-child play interaction and peer interactive competence. *Child Development, 55,* 1265–1277.

Main, M., & Weston, D. R. (1981). The quality of the toddler's relationship to mother and to father: Related to conflict behavior and the readiness to establish new relationships. *Child Development, 52,* 932–940.

Marrow, A. J. (1977). *The practical theorist: The life and work of Kurt Lewin.* New York: Teachers College Press.

May, M. A. (1932). The foundations of personality. In P. S. Achilles (Ed.), *Psychology at work* (pp. 81–101). New York: McGraw-Hill.

Mead, G. H. (1934). *Mind, self, and society.* Chicago: University of Chicago Press.

Moen, P., & Erickson, M. A. (1995). Linked lives: A transgenerational approach to resilience. In P. Moen, G. H. Elder Jr., & K. Luscher (Eds.), *Examining lives in context: Perspectives on the*

ecology of human development (pp. 169–210). Washington, DC: American Psychological Association.

Moorehouse, M. (1986). *The relationships among continuity in maternal employment, parent-child communicative activities, and the child's social competence.* Unpublished doctoral dissertation, Cornell University, Ithaca, NY.

Pastor, D. L. (1981). The quality of the mother-infant interaction and its relationship to toddlers' initial sociability with peers. *Developmental Psychology, 17*(3), 326–335.

Plomin, R. (1993). Nature and nurture: Perspective and prospect. In R. Plomin & G. E. McClearn (Eds.), *Nature, nurture, and psychology* (pp. 459–486). Washington, DC: American Psychological Association.

Plomin, R., & Bergeman, C. S. (1991). The nature of nurture: Genetic influence on "environmental" measures. *Behavioral and Brain Sciences, 4,* 373–427.

Plomin, R., & McClearn, G. E. (Eds.). (1993). *Nature, nurture, and psychology.* Washington, DC: American Psychological Association.

Plomin, R., Reiss, D., Hetherington, E. M., & Howe, G. W. (1994). Nature and nurture: Genetic contributions to measures of the family environment. *Developmental Psychology, 30,* 32–43.

Pulkkinen, L. (1983). Finland: The search for alternatives to aggression. In A. P. Goldstein & M. Segall (Eds.), *Aggression in global perspective* (pp. 104–144). New York: Pergamon Press.

Pulkkinen, L., & Saastamoinen, M. (1986). Cross-cultural perspectives on youth violence. In S. J. Apter & A. P. Goldstein (Eds.), *Youth violence: Programs and prospects* (pp. 262–281). New York: Pergamon Press.

Riksen-Walraven, J. M. (1978). Effects of caregiver behavior on habituation rate and self-efficacy in infants. *International Journal of Behavioral Development, 1,* 105–130.

Rodin, J., & Langer, E. J. (1977). Long-term effects of a control-relevant intervention with the institutionalized aged. *Journal of Personality and Social Psychology, 35,* 897–902.

Rotter, J. (1966). Generalized expectancies for internal versus external locus of control of reinforcement. *Psychological Monographs: General and Applied, 80,* 1–28.

Rutter, M., & Rutter, M. (1992). *Developing minds: Challenge and continuity across the life span.* New York: Penguin Books.

Scarr, S. (1992). Developmental theories for the 1990s: Development and individual differences. *Child Development, 63,* 1–19.

Scarr-Salapatek, S. (1971). Race, social class, and IQ. *Science, 174,* 1285–1295.

Small, S., & Luster, T. (1990, November). *Youth at risk for parenthood.* Paper presented at the Creating Caring Communities Conference, Michigan State University, East Lansing.

Sroufe, L. A. (1990). An organizational perspective on the self. In D. Cicchetti & M. Beeghly (Eds.), *The self in transition: Infancy to childhood* (pp. 281–307). Chicago: University of Chicago Press.

Sroufe, L. A., Fox, N. E., & Pancake, V. R. (1983). Attachment and dependency in developmental perspective. *Child Development, 54,* 1615–1627.

Steinberg, L., Darling, N. E., & Fletcher, A. C. (1995). Authoritative parenting and adolescent adjustment: An ecological journey. In P. Moen, G. H. Elder Jr., & K. Luscher (Eds.), *Examining lives in context: Perspectives on the ecology of human development* (pp. 423–466). Washington, DC: American Psychological Association.

Sundet, J. M., Tambs, K., Magnus, P., & Berg, K. (1988). On the question of secular trends in the heritability of intelligence test scores: A study of Norwegian twins. *Intelligence, 12,* 47–59.

Terman, L. M. (1925). *Genetic studies of genius: Vol. 1. Mental and physical traits of a thousand gifted children.* Stanford, CA: Stanford University Press.

Tobach, E. (1981). Evolutionary aspects of the activity of the organism and its development. In R. M. Lerner & N. A. Busch-Rossnagel (Eds.), *Individuals as producers of their development: A life-span perspective* (pp. 37–68). New York: Academic Press.

Tobach, E., & Schneirla, T. C. (1968). The biopsychology of social behavior of animals. In R. E. Cooke & S. Levin (Eds.), *Biologic basis of pediatric practice* (pp. 68–82). New York: McGraw-Hill.

Tulkin, S. R. (1973). Social class differences in infants' reactions to mothers' and stranger's voices. *Developmental Psychology, 8*(1), 137.

Tulkin, S. R. (1977). Social class differences in maternal and infant behavior. In P. H. Leiderman, A. Rosenfeld, & S. R. Tulkin (Eds.), *Culture and infancy* (pp. 495–537). New York: Academic Press.

Tulkin, S. R., & Cohler, B. J. (1973). Child-rearing attitudes and mother-child interaction in the first year of life. *Merrill-Palmer Quarterly, 19,* 95–106.

Tulkin, S. R., & Covitz, F. E. (1975, April). *Mother-infant interaction and intellectual functioning at age six.* Paper presented at the meeting of the Society for Research in Child Development, Denver, CO.

Tulkin, S. R., & Kagan, J. (1972). Mother-child interaction in the first year of life. *Child Development, 43,* 31–41.

Turner, P. J. (1991). Relations between attachment, gender, and behavior with peers in preschool. *Child Development, 62,* 1475–1488.

Wachs, T. D. (1979). Proximal experience and early cognitive intellectual development: The physical environment. *Merrill-Palmer Quarterly, 25,* 3–42.

Wachs, T. D. (1987a). The short-term stability of aggregated and non-aggregated measures of infant behavior. *Child Development, 58,* 796–797.

Wachs, T. D. (1987b). Specificity of environmental action as manifest in environmental correlates of infant's mastery motivation. *Developmental Psychology, 23,* 782–790.

Wachs, T. D. (1989). The nature of the physical microenvironment: An expanded classification system. *Merrill-Palmer Quarterly, 35,* 399–402.

Wachs, T. D. (1990). Must the physical environment be mediated by the social environment in order to influence development: A further test. *Journal of Applied Developmental Psychology, 11,* 163–170.

Wachs, T. D. (1991). Environmental considerations in studies with non-extreme groups. In T. D. Wachs & R. Plomin (Eds.), *Conceptualization and measurement of organism-environment interaction* (pp. 44–67). Washington, DC: American Psychological Association.

Wachs, T. D., & Chan, A. (1986). Specificity of environmental actions as seen in physical and social environment correlates of three aspects of 12-month infants' communication performance. *Child Development, 57,* 1464–1475.

CHAPTER 15

Phenomenology and Ecological Systems Theory: Development of Diverse Groups

MARGARET BEALE SPENCER

INTRODUCTION AND RATIONALE: A NEED FOR NEW THEORY 830
CONCEPTUAL SHORTSIGHTEDNESS IN THE STUDY OF DIVERSE YOUTH: CHILDREN OF COLOR AND PRIVILEGE 833
Flaw One: Context Ignored 833
Flaw Two: Racism Ignored 836
Flaw Three: General Lack of a Developmental Perspective When Considering Youth of Color 838
Summary 843
PHENOMENOLOGICAL VARIANT OF ECOLOGICAL SYSTEMS THEORY: MULTIDISCIPLINARY, DYNAMIC, SYSTEMIC INFLUENCES, AND PROCESSES OF A SYNTHESIZED RECURSIVE FRAMEWORK 844
The Foundational Role of Social Cognition and Linkages to Phenomenology: Inference-Making, Perceptions, and Youths' Everyday Experiences 844
Systems Framework in an Ecological System 847
CROSS-CUTTING HUMAN DEVELOPMENT THEMES OF PHENOMENOLOGICAL VARIANT OF ECOLOGICAL SYSTEMS THEORY: SALIENT FOR THE DESIGN OF INTERVENTIONS AND THE INTERPRETATION OF COPING OUTCOMES 853
Importance of Broad Cultural Inclusiveness and Context 854
ECOLOGICAL PERSPECTIVES: EXPLORING THE BIOECOLOGICAL MODEL 864
Ecological Systems Theory 865
TWENTIETH-CENTURY SOCIAL SCIENCE ASSUMPTIONS AND PRACTICES, JUDICIAL DECISIONS, AND THEIR IMPLICATIONS FOR THE NET VULNERABILITY OF DIVERSE YOUTH 868
Inferences, Assumptions, and What *Brown v. Board of Education* Should Have Considered: Contemporary Implications for Research, Practice, and Theorizing 868
Traditional Assumptions, Beliefs, and Values: The Conceptual Benefits of a Phenomenological Variant of Ecological Systems Theory Framework 872
Cross-Disciplinary Contributions from Legal Studies 874
AN EXAMPLE OF AFRICAN AMERICANS AND THE ACHIEVEMENT GAP: AN INTERFACE OF STIGMATIZING CONTEXT, REACTIVE COPING RESPONSES, AND THE "ACTING WHITE" MYTH 878
Historical Overview of African American Achievement Motivation 879
Black Response to Freedom: A Social Movement for Education 880
RACISM AND HUMAN DEVELOPMENT 883
CONCLUSIONS AND PHENOMENOLOGICAL VARIANT OF ECOLOGICAL SYSTEMS THEORY INFLUENCED INTERPRETATIONS OF YOUTHS' STAGE-SPECIFIC COPING OUTCOMES AS A FUNCTION OF NET VULNERABILITY 885
Conceptual Advantages of Phenomenological Variant of Ecological Systems Theory as a Dual Axis Coping Outcome Interpretational Framework of Human Development: Traditional and Limited Dual Axis Perspectives 886
Predicting Positive Outcomes in the Face of Challenge 887
REFERENCES 888

This chapter's organization serves to capture the *distinctive contributions of phenomenological variant of ecological systems theory (PVEST) to available human development theorizing*. Thus, following a brief introductory section, we provide a full presentation of the PVEST framework, and, although applying it to the preschool through adolescence period, introduce PVEST as a life-span model of human development. The next section demonstrates why the theory promotes an identity-focused cultural ecological (ICE) perspective. It reviews (a) the fact of human vulnerability (i.e., the presence of both risks and protective factors), (b) the

normative experience of stress, (c) the need for reactive coping responses, (d) the role of emergent (stable) identities, and (e) the links with the unavoidability of stage-specific and patterned coping outcomes. As lives unfold over time, stage-specific coping outcomes contribute to the next period's level of vulnerability. Thus, we also illustrate the dynamic character of PVEST. As a system of experiences, the interpretation of patterned outcomes (i.e., referred to as culture) are described as having important implications for group experiences (e.g., as stigma, bias, or privilege) or individual supportive models for emulation (e.g., character development).

To illustrate the themes noted and as a strategy for comparing and contrasting the experiences of diverse groups of youths, the third section affords an examination of several cross-cutting themes of human development established by the recursive character of PVEST, which exemplifies the connectedness between individual characteristics and context interactions.

We point out that *by diverse youth, we refer to all ethnicities and races (i.e., unless we specify—diverse youth of color).* This clarification is critically important because Whites are often not considered under diversity labels, given a frequent assumption that they represent the norm rather than one ethnic experience among many. The primary point is that, all groups have distinctive histories and responsive traditions that evolve into both unique yet similar cultural patterns. Accordingly, a major influence described throughout the chapter for diverse youth is the impact of distinctive conditions for each and the role of history.

The fourth section utilizes the 1954 Supreme Court decision in *Brown v. Board of Education* for highlighting and indicating the impact of policy change and its role in determining long-term youth experiences generally and schooling specifically. Additionally, the interactions between context and culture are presented and the contributions of critical race theory (CRT) explored for describing the individual-context-process links for White youth. In parallel fashion, the implications of White privilege for some and the implications of its absence for others is analyzed.

The fifth section provides an illustration of the recursive processes for African American male adolescents as an example for understanding their stage-specific coping outcomes as a function of vulnerability (i.e., balance between risks and protective factors) as demonstrated from a PVEST perspective. Finally, the sixth section of the chapter describes the distinct interpretational advantages of the PVEST framework and highlights competing traditional frameworks while also explaining their limitations.

INTRODUCTION AND RATIONALE: A NEED FOR NEW THEORY

An *inclusive framework* for understanding life-course development is long overdue. The narrowness of views concerning inclusiveness have made such a framework, at best, an illusive goal for child development. As used here, the term *inclusive* refers to a perspective relevant to the contextual and cultural experiences of diverse groups. Thus, an inclusive framework suggests an authentic rendering of developmental processes for humans considered diverse as a function of characteristics such as race, gender, ethnicity, socioeconomic status, immigration status, faith community, skin color, and nativity.

PVEST (Spencer, 1995) provides a *developmental, process-oriented, and context-sensitive* focus. Thus, it affords unique conceptual contributions to developmental psychology, specifically, and to the field of human development, more broadly. As a systems theory, PVEST considers and includes the prior emphases noted along with a combined concern with *culture,* as lived and experienced at multiple levels of the environment, and individuals' own *perceptions.* Similar to Glen Elder's (1974) sociohistorical analysis of the impact of the Great Depression on human development, the PVEST framework acknowledges as a central tenet the historical and contemporary impact of social policy (e.g., the *Brown v. Board of Education* decision or the significant immigration policy shifts) on the social, cultural, and political context for the nation's diverse youth and their families. Considered together, the theory's value emanates from simultaneous attentiveness to (a) multiple layers of the environment, (b) normal human processes that unfold in varied settings with multiple others, (c) historical factors and social policy that are associated with long-standing and contemporary structural conditions and social relations, and (d) cultural sensitivity to the traditional ways the authentic everyday experience of human development in context is interpreted.

The specific combination and integration of factors indicated improves our understanding about the *how* of life-course human development while it acknowledges both behavioral and genetic perspectives (e.g., Spencer & Harpalani, 2004). Accordingly, as a *systems frame-*

work that takes into account the individual's perspective, or phenomenology (see Rogers' perspective as reviewed in Schultz, 1976), PVEST affords specificity about the individual-context-process nexus as suggested by Bronfenbrenner's (1977, 1989, 1992, 1993) ecological systems theory. The integration imparts significant benefits. Foremost, given its linkages to both observed and perceived context features, the framework provides enhanced understanding of foundational processes and stage-specific outcomes of *diverse groups and individuals* (see Spencer & Harpalani, 2004). Specifically, as indicated, it enhances the interpretation of disparate appearing developmental patterns and outcomes by explicating the *how* of development for diverse groups (a) sharing what appears to be the same space and opportunities, (b) attempting behavioral responses to seemingly parallel human development tasks and stage-specific expectations for competence, but frequently (c) demonstrating disparate behavioral outcomes in response to myriad challenges.

This chapter is intended to provide an updated description and explanation of PVEST, first published a decade ago (Spencer, 1995). Given the 10-year interim, this update is informed by dozens of *empirical* publications that describe analyses designed to demonstrate components of the systems theory (e.g., Fegley, Spencer, Goss, Harpalani, & Charles, in press; Spencer, Dupree, Cunningham, Harpalani, Munoz-Miller, 2003; Spencer, Dupree, Swanson, & Cunningham, 1996, 1998; Spencer, Fegley, & Harpalani, 2003; Swanson, Spencer, Dell'Angelo, Harpalani, & Spencer, 2002). Additional published work utilizes the theory for *clarifying conceptual themes and relationships* (e.g., Lee, Spencer, & Harpalani, 2003; Spencer, Dupree, & Hartmann, 1997; Spencer & Harpalani, 2004; Spencer & Jones-Walker, 2004). Finally, *qualitative analyses* derived from PVEST (i.e., either single-method studies or multimethod publications that include empirical demonstrations) provide helpful illustrations. Multimethod publications augment and make obvious speculative theoretical linkages by providing the voices or expressed meaning-making of young people themselves (e.g., Spencer, Silver, Seaton, Tucker, Cunningham, & Harpalani, 2001; Youngblood & Spencer, 2002).

This current and updated version of PVEST is consistent with established associations demonstrated between young children's normal cognitive, affectual, and social-developmental processes (e.g., Spencer, 1982, 1983, 1985, 1990). It reasserts the important foundational role of perceptual processes in development (e.g., social cognition; children's theory of mind) and reinforces the need to integrate a phenomenological perspective (see Rogers & Kelly as reviewed in Schultz, 1976) to (a) explain life-course developmental processes and thematic outcomes, (b) explicate the role of cultural traditions, (c) specify the contribution of history (both for immigrants and more long-term and indigenous groups; [see Johnson-Powell & Yamamoto, 1997]), and (d) indicate the critical contributions of context quality for individual-context interactions. The expanded description of *context* this model allows specifies how the role of historical factors is important at several levels, and it acknowledges individual differences in levels of vulnerability (i.e., the presence of risk and protective factors). The framework also enhances the interpretation of varied outcomes (i.e., productive and unproductive) experienced by diverse group members as each transitions across contexts (see Figure 15.1). Additionally, the framework focuses on the roles mediating processes play between vulnerability levels and the coping outcomes individuals experience as they transition across the life course. The processes provide illumination as individuals confront both unique challenges and contextual provocation (see Lee et al., 2003) while attending to the sets of normative life-course developmental tasks initially described by Havighurst (1953).

Frequently, when attempting to disentangle and interpret the complexities of the multiple coping trajectories possible, given the normative character of the developmental tasks noted, several important contributing factors are usually overlooked. For example, vulnerability is often assumed to be the presence of risks only *without* an acknowledgment of protective factors. Worse yet, particular outcomes are assumed for specific groups. For example, unproductive outcomes are tacit expectations for marginalized groups (see Figure 15.2).

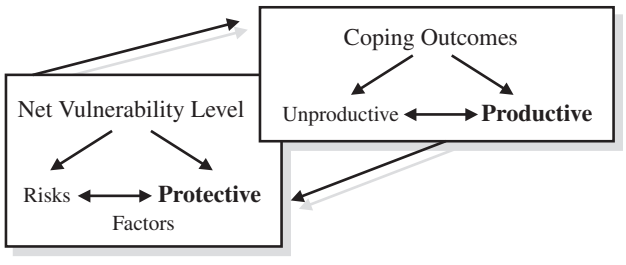


Figure 15.1 Deterministic thinking: Traditionally linear hypothesized relationship between youth characteristics and outcomes.

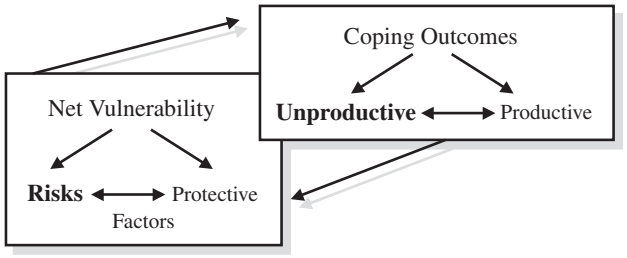


Figure 15.2 Deficit emphasizing: Perspective generally assumed a priori for minorities.

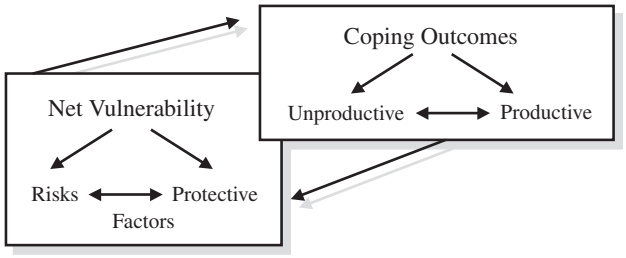


Figure 15.3 Creating new inclusive theorizing requires analyzing both protective factor presence as well as the nuanced character of risks (e.g., unacknowledged privilege).

In the first published rendering of the theory, only risks were explicitly indicated, although the buffering power of protective factors was inferred. However, given ongoing readings of the literature, a pattern has emerged. Assumptions of productive outcomes and successes (i.e., as the standard applied to all) have often been implied for those considered to be empowered (i.e., males, middle-income people, and generally Caucasians). Even if vulnerability is acknowledged and coping products are specified for privileged youth, there is often a narrow focusing on only productive outcomes and success. This results in a degree of conceptual shortsightedness, which produces very deterministic analyses, as suggested by Figure 15.1. Another pattern, however, is also evident. For those youth perceived as marginal individuals (i.e., African Americans, low-resource persons, Hispanics or subgroups of Asian Americans—e.g., Hmong), too much emphasis is often placed on unproductive coping products. Given the lack of economic viability that often exists in communities where marginalized individuals live, countless protective factors matter but are often overlooked. Protective factors as buffers have important implications for overall level of vulnerability. Unfortunately, as suggested, protective factors are neither assumed nor frequently explored for those perceived as marginal.

Identity processes, as either the product of basic temperament and/or particular socialization experiences, have been shown to serve specific protective functions (e.g., Spencer, 1983, 1988). Unfortunately, except for the copious self-esteem studies, they are *infrequently inferred* and considered in research and theorizing about individual vulnerability level. Thus, as suggested in Figure 15.3, this chapter and suggested framework also consider the numerous unique and shared protective factors available to and accessed by diverse youth.

Accordingly, several essential factors are emphasized that allude to both risks *and* protective factors that are generally ignored even though they certainly contribute to a priori assumptions and inferences made about the vulnerability of individuals and groups. Moreover, they are often overlooked in the conduct of basic developmental science. They are not only included here but also especially highlighted because they represent core perspectives and contribute to specific social dynamics, which include: (a) *social stigma*—the disparagement of groups and individuals based solely on particular person characteristics (e.g., color, race/ethnicity, immigration status, religion, and social class; see Jaret, 1995); (b) *privilege*—the unacknowledged advantaging of some that places others at a distinct disadvantage (see Ignatiev, 1995; McIntosh, 1989); and (c) *persistent economic and social inequities*—the unfair burden and challenge to specific individuals, families or groups (see Darity & Myers, 1998; Jarrett, 1994, 1995).

When all three are considered together, the combination suggests the salient contributions of CRT for the explicitly broadened framework. Although these themes have always been implicit in our view of the theory's many strengths, the specific integration and inclusion of CRT allows for a more productive consideration of race. Originating in legal scholarship, CRT explicates how the use of policies upheld by laws but shaped by biases and perspectives concerning race are not unimportant to the unfolding life course (e.g., Bonilla-Silva, 2001). CRT—the perspective acknowledging the historical centrality and involvement of law in upholding White supremacy and associated hierarchies of gender, sexual orientation, immigration, faith community, and social class (see Crenshaw, Gotanda, Peller, & Thomas, 1995)—illustrates how law and policy are frequently shaped by race. All have important implications for the flaws that continue to hamper our research efforts to understand both the processes and outcomes, which promote and protect the well-being and development of diverse youth.

CONCEPTUAL SHORTSIGHTEDNESS IN THE STUDY OF DIVERSE YOUTH: CHILDREN OF COLOR AND PRIVILEGE

Shortsighted and erroneous perspectives about diverse youth fall into two major categories. The *first major categorical error* suggests that Caucasian children (i.e., or assumptions about their development) represent the standard of normalcy for all others. This group is most often the subject of *normative* studies conducted in developmental and social sciences. The *second category of conceptual errors* represents the perceptions about minority status youth or youth of color and their assumed atypicality. This shortsightedness also includes references used to describe the group itself: Given the changes in American population statistics, the grouping previously referred to as *minorities* is moving toward *majority status* and—although not widely—has more recently been referred to as AHAANA (Asian, Hispanic, African American, and Native American). An aspect of the privileged status associated with Caucasians is that even the term *diversity* or *diverse youth,* unfortunately, *in*consistently elicits images of Whites. Frequently, referencing diversity suggests a concern with adding minorities to a particular issue or task. For example, the role of diversity task forces is often to highlight issues that are inclusive of non-Whites. Implicit in the designation is that, without a gentle reminder, the tradition is to ignore non-Whites: Whites are assumed to represent normative development themes, and minorities (or the poor) are highlighted when adversity, pathology, deviance, or problems are of topical interest.

In this chapter, we evoke a different approach. We use the term *diverse youth* in this chapter *to include both European American (Caucasian) and AHAANA (frequently marginalized) youth*. Unlike the narrow and exclusively positive connotations associated solely with European Americans (Caucasians) and the more limited (and generally negative) imagery linked with diverse youths' of color representation in the social sciences generally and developmental science specifically, we posit a strategy that acknowledges several major conceptual defects that our proposed framework seeks to remedy.

Flaw One: Context Ignored

First, as consistently shared (e.g., Spencer 1985, 1995; Spencer et al., 2006), ecology has been frequently *viewed as* a nonissue in the consideration of human development. Context has also been ignored. This appears particularly relevant, when context creates a source of consonance (i.e., inferences of mainly support), or, in contrast, dissonance (i.e., a lack of individual-environment fit). Thus, when behavioral outcomes are viewed as problematic, the pattern has been to *not* consider the context, but to infer a relational pattern that localizes the problem in the individual. As suggested, negative inferences have more often than not been localized around human development experiences assumed for youth of color (see Kardiner & Ovesey's, 1951, *Mark of Oppression;* Pettigrew's, 1964, *Profile of the Negro American*). The position of these treatises has been consistent in either pathologizing individuals or positing a style of analysis that associates particular behavioral patterns with specific characteristics of settings (see Elliott Liebow's 1968 classic sociological statement *Tally's Corner*). An acknowledgment that these early and significant social science contributions never placed the burden on a socially constructed context is important. Rather, more often than not, problematic behavioral correlates reported or inferred were linked with or credited to individuals who happened to live in those contexts. The consistent assumption communicated was that the pathology of the individuals themselves created the untoward character of the settings, however, at the same time, enlightened and more sophisticated analyses were available.

The critical and long-term insights provided by early ecological psychologists such as Roger Barker, Herbert Wright, and Paul Gump (see Barker & Wright, 1949, 1954; Gump & Sutton-Smith, 1955; Wright, 1967), and later broadened and refined by Urie Bronfenbrenner (see Bronfenbrenner, 1985, 1992, 1993; Bronfenbrenner & Crouter, 1983), existed and continue to provide critical insights. Fieldwork by ecological psychologists in the United States and England obtained definitive findings concerning the reciprocal links between the individual and context: Conceptual contributions by Bronfenbrenner illustrated the indisputable interactions, and space psychologists such as Joachim Wohlwill (Wohlwill, 1985; Wohlwill & Heft, 1987) clearly explicated the reciprocal links further. Considered together, given the different though parallel methodological and conceptual strategies, they quite persuasively linked individual experiences with context character.

Relatedly, if the character of context is socially constructed (i.e., given provisions and omissions of support as policy decisions and social traditions), then, from a CRT perspective, policies concerning (a) the owning of

slaves, (b) the separations imposed on slave families (i.e., separating fathers from mothers and children), (c) the use of immigrants and slaves for free labor (see Baron, 1971), and (d) the framed policies and enacted traditions to limit the education of slave children (see Spencer, Cross, et al., 2003) or import immigrant men only as free laborers had long-term consequences: The attendant decisions virtually guaranteed contextual conditions as stigma-producing and peculiar situations that would foster problems for subsequent generations (both for those deemed marginal and those—although unacknowledged—deemed privileged). Accordingly, and as suggested by the examples provided, the observations noted have special import to diverse youth of color and their families.

Frequently, these youngsters' development is assumed to be and studied as if it emanates from a vacuum of experience. Inferences about diverse youths' of color development associated with broad structural, physical, historical, and social contexts as well as inherited conditions are overlooked. CRT's emphasis on the methods by which attitudes about race influence decisions in the U.S. court system aids in excoriating the shortsightedness concerning guarantees of equity and equality of experience. However, in the social sciences and child development literatures, the unequal conditions and historical circumstances that diverse youth have inherited, grown up with, and psychologically developed in response to are, for the most part, inadequately considered or totally ignored. For example, considered as oversights are the numerous manifestations of symbolic and structural racism, economic hardships, social inequities, and related barriers that appear to characterize the environments encountered by children and youth of color. Moreover, their stage of development (i.e., cognition-based meaning-making processes) determines the level of sophistication concerning their own inferences about their situation. Further, given vulnerability level as a function of cultural socialization, parental monitoring, and other available protective factors, diverse youth reactively cope in ways that may be either facilitating or exacerbating.

Protective factors often remain unnoticed in the design and conduct of developmental science, even though an anthropologist would never purport to engage in field-based research without knowing something about the group of interest. This knowledge is assumed to go significantly beyond self-esteem knowledge (i.e., the construct of choice by many social scientists). Unfortunately, the implicit, conceptually intrusive, although unappreciated, prevalent mind-set by scholars in developmental psychology is that *macrolevel conditions* experienced at the micro-, meso-, and exolevels of social ecologies (i.e., generally reported as sample demographics) do not deserve serious attention. However, enough research, conceptual frameworks, and new theories demonstrate not if but *how much* these factors *matter* in the lives of children.

Further, the resistant and limiting shortsightedness described suggests that when these factors are brought to conscious awareness through journal policies and federal funding initiatives, the impact of the many levels of ecologies described by Bronfenbrenner (1979) and others persist as merely *acknowledged* (i.e., as statistically manipulated control variables), but not as factors that impact the questions posed, balanced character of the samples (or not), and constructs identified and measured. Moreover, there has been a general disregard for individuals' own perceptions and meanings made from the multiple ecologies traversed, contexts psychologically experienced (see Steele, 1997; Steele & Aronson, 1995), and limitations explicitly and subtly imposed (see Chestang, 1972). Perceptions have important implications for emotional reactions and subsequent analyses inferred as human processes that fuel reactive (see Stevenson, 1997) and stable repetitive coping responses. Patterns of shortsightedness remain for those producers of science following 3 decades of cogent critiques, which highlighted major methodological and conceptual shortcomings of the research enterprise (e.g., Banks, 1976; Guthrie, 1976). For example, the continuing use of uneven comparison groups (e.g., low-income diverse youth compared to middle-income European American samples) has implications for the interpretation of findings and perpetuation of social stigma (see Steele, 1997; Steele & Aronson, 1995).

Frequently, the conceptual problems described appear to be resistant to change. Even when the problem of unequal samples is not an issue, the measurement of identified variables is frequently insufficient. Identified variables and measures lack psychometric integrity across diverse groups, and inferred meanings represent an unaddressed conundrum: Constructs may lack conceptual validity (i.e., meanings may not be shared). Often, particular group members' experiences at the microsystem level may vary, given individual-context linked challenges, coping requirements (i.e., the degree to which social dissonance or consonance is experienced), and reactive coping strategy availability (see Stevenson, 1997). Further, because many research ini-

tiatives are well-funded as large multisite, longitudinal data-gathering enterprises, particularly for young investigators and dissertating students, *strong encouragement is provided or incentives are made available for secondary data analytic options—no matter how ill-conceived the study.* Consequently, the predominance of inadequate conceptualizations and data interpretations remains in the literature for significant periods.

Deficit Perspectives and Stigma about Diverse Youth of Color

As suggested in Figure 15.2, research that depicts diverse youth of color's development in the context of family, school, community, and broader macrostructural determined conditions continues to be highly deficit-oriented. For over a 50-year period, presented through a deficit-oriented, linear, and deterministic conceptual lens, diverse youth of color were shortsightedly viewed as pathological products of oppression (e.g., Kardiner & Ovesey, 1951), where only the negative outcomes associated with some of these youth were studied. Such myopic tendencies continue to this day. The resiliency—health and mastery demonstrated in high-risk environments—associated with many youths' coping efforts remains generally ignored. As noted in Figure 15.2, the monolithic perspective about youths' experiences is not only deterministic in nature but also ignores the resilience of those who do succeed in spite of tremendous barriers. Given recent discourse on the topic of resiliency, the penchant to ignore resiliency may be an effort to underemphasize the contributions of socially constructed conditions that privilege some and undermine others (see Luthar & Cicchetti, 2000), thus, making particular diverse youths' developmental tasks difficult, at best, or a double quandary, at worst (see Boykin & Ellison, 1995).

For some, perhaps a triple quandary is more accurate when the special burden of gender is added and considered for African American male youths' experiences (Boykin, 1986). In addition to the chronic struggles that are linked to race, ethnicity (see Allen, Spencer, & Brookins, 1985; LaFromboise, 1988; Spencer, 1990; Spencer & Markstrom-Adams, 1990; Spencer & Dornbusch, 1990), and immigration status (Huang, 1989; Liu, Yu, Chang, & Fernandez, 1990), socioeconomic challenges frequently remain. Importantly, these challenges appear endemic, persistent, and are associated with parenting conditions (i.e., work, housing and neighborhood adequacy, stable relationships, and parenting time availability); they also present unique difficulties for adults caring for the very young (Jarrett, 1994, 1995) through to the middle childhood period (McLoyd, 1990). They may be further imperiled by biculturalism efforts (LaFromboise, Coleman, & Gerton, 1993). Struggles experienced include those that are encountered not only at home (Boyd-Franklin, 1989; Boykin & Toms, 1985) but also at school (Ladson-Billings, 1994; Lee et al., 2003). Their impact may be exacerbated by gender when experienced by girls under dense and unsafe conditions (e.g., Ladner, 1972). Although such struggles are particularly difficult for males given the more valued status enjoyed by most males in the majority of the globe, thus providing high expectations for *all males* without necessarily conditions of attendant supports (Nanda, 1974). Problematic structural conditions persist, yet the majority of young diverse youth of color manage to cope adaptively, although their efforts are infrequently recognized and factored into the design of research, selection of constructs, specific questions posed, or the interpretation of findings.

Accordingly, a priori assumptions about diverse youth of color infer risks alone without *also emphasizing and exploring the presence of protective factors.* Moreover, the frequent focus on risks and their linkages to problems leads social scientists to assume only unproductive and homogeneous outcomes and labels such as castelike minorities (see Fordham & Ogbu, 1986; Ogbu, 1985; and critiques by Spencer, 2001; Spencer, Cross, et al., 2003; Spencer & Harpalani, under review). The shortsighted perspective and concomitant assumptions fuel deterministic assumptions, which may reinforce stereotypes (see Figure 15.2). Although infrequently acknowledged for privileged youngsters (i.e., middle-income Caucasians), all humans are vulnerable at some level (i.e., burdened with risks and buoyed by protective factors). However, as suggested previously in Figure 15.1, the degree of vulnerability can be determined only from an appreciation of *both* risks *and* protective factors. A narrow assessment of high vulnerability that is associated with socially constructed risk conditions but which frequently ignores protective factors epitomize poor science. There is a specific need to also understand available protective factors to achieve an accurate understanding and assessment of vulnerability (Luther & Becker, 2002; Luther & Latendresse, 2002).

An analogy from the pharmaceutical sciences is easily understood because the public would not use, or the medical establishment designate, a drug regimen without also understanding the other "knowns" or protective

factors concerning its intended use. For example, information related to safety and protection might include (a) establishing the number of milligrams of the drug's active ingredient per kilogram of the user's body weight, (b) possessing no known allergies to the drug, (c) not taking other drugs known to cause untoward interactions with the drug intended for use, and (d) lacking the presence of concomitant medical conditions for which the drug would be counter-indicated (e.g., a pregnant woman drinking alcohol during the pregnancy). This illustration is helpful given scientific knowledge concerning the teratogenic influence of many over the counter, nonprescription drugs (e.g., aspirin and motion sickness remedies) on prenatal and neonatal development (Note: Teratogenic substances are those found to have an adverse impact on fetus and infant health, growth, and development). Thus, it is *not a new perspective* to undertake thorough understandings about individual and group vulnerability in some fields. This is done by contemplating both anticipated risks and protective factors. This procedure appears relevant irrespective of a specific issue (e.g., applying for a job, contemplating a vision screen for contact lenses or laser surgery, considering a medicinal regimen for health maintenance, or contemplating marriage). Curiously so, and as illustrated, a decision-making style that bears in mind both risks *and* protective factors appears less prevalent when inferences concerning race, ethnicity, and socioeconomic disparity themes are at issue.

Unfortunately, for diverse youth of color, simplistic analyses and dependence on risk characteristics are most often the norm rather than the analytic exception. As suggested, the approach is not only ultimately stereotype-dependent but also tends to produce or reinforce further stigma and stereotyping. In presenting alternative and inclusive theorizing, we propose an improved and nuanced analysis. The conceptual strategy described suggests improved interpretations of disparate findings frequently obtained for youth who *appear to share* family, school, and neighborhood contexts. Additionally, a more analytic approach that recognizes, incorporates for consideration, and specifically elucidates the role of protective factors in youths' lives might facilitate improved understandings about high-risk presence *along with* patterns of positive coping outcomes (i.e., resiliency). The suggested approach might aid the identification of culture-sensitive and context-linked supports and remedies. In sum, for youth of color, social scientists too frequently err on the side of negative, linear, and deterministic thinking (i.e., high risks are linked narrowly and often solely with untoward expectations). Figure 15.1 noted another deterministic pattern used in the consideration of European American youths' experiences.

As reported, the prevalent although simplistic perspective noted in Figure 15.2 leaves the analogous issues *ignored* among European American youth (e.g., teen pregnancy and abortion use, White male aggression, and high suicide rates). Further, when pursuing remedies for enhancing productive youthful outcomes, the situation described (i.e., overlooking protective factors) for diverse youth of color leaves practitioners with the narrow and erroneous assumption that untoward outcomes can be remedied from a one-size-fits-all perspective. As suggested by Figure 15.3, assumptions about inherent protective factor presence and a total absence of acknowledged risks (i.e., in the case of privileged youth) may exacerbate vulnerability level. Examples from Littleton, Colorado, manifested by the Columbine High School killings by upper middle-income European American youths, clearly demonstrate the downside of privilege and reaffirm the salience of adaptive coping skills for promoting healthy identity processes and stage-specific competence (refer to Figure 15.3). Undoubtedly, the appearance of resilience among low-income, immigrants, and minority youth is not well-studied and is often misunderstood or overlooked (e.g., Fordham & Ogbu, 1986) as illustrated by Ogbu's "acting White" assertions concerning patterns of *under*-achievement for some African American and Hispanic youth. Unfortunately, given its broad presence in the popular media, Ogbu's (1985) limited perspective frequently reinforces stigmatizing and stereotyping beliefs without affording an understanding of the outcomes and mediating processes. As suggested, this penchant is most evident when matters of race, ethnicity, and social class are at issue. CRT would suggest that *assumptions concerning each* are frequently made and impair the possibility of equitable treatment.

Flaw Two: Racism Ignored

Unaddressed contextual and psychological issues such as racism and class inequities may potentially impact child and adolescent perceptions of self, others, and decision making about the current coping responses expected and required given normative and unique challenges; also influenced are preparations for future life prospects. In parallel fashion, although there are a few recent exceptions (e.g., Luthar, 2003; McIntosh, 1989), beliefs about

privilege (or its absence) are seldom acknowledged and considered in the conceptualization and conduct of research on European American youth, while behaviors such as off-time sexual activity, behavior problems, underachievement, and aggressiveness are emphasized for youth of color.

As stated previously, endemic and long-term economic and social barriers are ignored frequently, leaving to be inferred that all problems are inherent in the individual. Further, and most important, the unacknowledged social consonance (i.e., optimal individual-context fit) frequently experienced by European Americans, given race-associated privileges, are imposed as the norm and expressed as the *outcomes expected for all.* Although for youth of color, supports afforded from protective factors (e.g., prior cultural socialization experiences including church engagement and very close parental monitoring) and manifested individual or family level resiliency factors evident are *infrequently assumed.* Critically important, the social construction of inequality through discounting the inequities noted within and between groups is infrequently recognized. They are not only *un*acknowledged but also often overlooked in the actual design of research and programming efforts. Worse, they are ignored in the evaluation of programs and attendant social policy development. Published review papers often list egregious scientific shortcomings (see Fisher et al. 2002); however, the challenges implied for their continuing presence and utilization in the making of public policy are *seldom actually acted on as sanctions*—when considering "what" gets funded, which research strategies are modeled, why there is a continuing general absence of research professors of color in academia, and how students are taught to understand the issues. Not only do programs of research and attendant publications continue to ignore the conceptual concerns identified thus far but also fail, as indicated, to consider the special relevance for White youths' developmental experience.

The issue of privilege is foundationally important particularly to the human development of Western youth. The *absence of dissonance* or appearance of maximal and patterned social consonance (i.e., maximized individual-context fit) may compromise the normal development of important *coping skills* (i.e., the handling of normative concerns and the responses to unique challenges) and *healthy identity processes* among these youths. Positive coping skills are important life-course acquisitions because they provide psychological protection and stability across time and place given the unavoidable, developmental, and countless challenges that accompany youths' pursuit of competence in response to stage-specific developmental tasks (see Havighurst, 1953). Moreover, the lack of an authentic identity that is linked to stable coping processes may have implications for the character of contexts enjoyed (or not) by others; this is particularly important given the universal life course need to cope effectively with stage-specific challenges and to maintain balance, even when not generally expected. Even after "objective needs" have been satisfied, Robert White eloquently describes the importance of "effectance" motivation in responding to the need to have an impact on the outside world (i.e., to demonstrate competence; R. White, 1959, 1960). Such a need has also been described as personal causation (see DeCharms, 1968). In sum, volitional history matters and a history of effective coping has implications for life-course demonstrated competence given numerous unique and normative challenges. An important challenge for many youngsters has been significant changes in family structure (e.g., increase in two-parent working families for European Americans and fewer three-generational family systems for youth of color).

Hetherington and Kelly (2003) and others have been prolific in describing the impact of divorce as a source of challenge for European American youth. Inferred is that a lack of experience with challenges and stress may have implications for the development of support-accessing abilities and the acquisition, honing, and exercise of adequate coping skills. Although generally not addressed in youth development studies, a consistently elevated pattern of completed suicide rates for European American males has not provoked the cause for alarm that the statistics and their stability over decades actually deserve. Given the economic, social, and developmental specific supports particularly available for European American males irrespective of social class versus youth of color (see Sullivan, 1989), broad research efforts focused on understanding this pattern's etiology failed to solve the conundrum. As tallied across 5 decades in half-decade analyses by Carroll and Tyler (2001) for the period 1940 to 1989, there are no differences for the 25- to 34-year age range between Black and White males. This period represents the highest peak for Black young adult males, however, suicide rates begin sooner and continue to increase through age 85 for European Americans. At that age, the average reported rate indicates three times the rate evidenced in the early adult years. When analyzing the data trends, Carroll and Tyler (under review) suggest a gender by race interaction in the maladaptive

response to stress. At the same time, even though European American males continue to enjoy the most lucrative life-course averages, when earnings and number of years of education completed are considered over the several decades of the life course, these males have a surprisingly high suicide rate. Although, attention has been paid to the change in peak level of completed suicides for Black young adult males (see Joe & Kaplan, 2002), the lack of anxiety or explanation for the *parallel lines of data* for European Americans when compared against average life income, cumulative education achieved, and *completed suicides* considered together and examined over several decades is cause for alarm.

Flaw Three: General Lack of a Developmental Perspective When Considering Youth of Color

As indicated, the developmental literature disproportionately focuses on the experiences of European Americans. Alternatively (as suggested by Figure 15.2), theorizing about youth of color frequently *underexamines* developmental processes and *overemphasizes* risk factors and unproductive stage-specific outcomes (e.g., early pregnancy, disproportionate incarceration rates, school failure, and aggression). The thematic patterns are both interesting and troublesome because the *normative* developmental thematic stressors experienced by youth of color, such as off-timed physical and social maturation and peer pressure issues, may be compounded by context character factors that are associated with racial stigma and color-linked traditions that assume equality of experience and exposures (see Spencer, 1985; Spencer & Dornbusch, 1990; Spencer & Markstom-Adams, 1990). Normative child and adolescent developmental processes, such as early maturation, when considered in conjunction with encounters of race and economic disparities (e.g., lack of job availability for parents, under-funded schools, unsafe neighborhoods, inadequate schooling opportunities, and unacknowledged racism) suggest inordinately stressful contexts for achieving healthy normative social experimentation opportunities necessary for development. Such conditions would be expected to have implications for phenomena such as off-timed pregnancies, juvenile justice contact, and underachievement in school. Yet, apart from a few exceptions (see Spencer et al., 2001), these perspectives are seldom acknowledged in publications on the topic. In short, developmental, process-oriented, and context-linked analyses are not emphasized for youth of color. Alternatively, for European American youth, the concomitant stress and challenges associated with unacknowledged privilege and its downside (e.g., inadequate coping opportunities that may be linked with high rates of male suicides), unfortunately, are seldom integrated into conceptual formulations of development. Certainly, as indicated, the implications of the latter for the development of coping skills remain an oversight in child psychology. The absence of publications on the downside of privilege is clearly demonstrated when considering the several examples of school-based killings. These occasions are made similar given the unexpected demographics of the perpetrators; one of the more recent examples, as noted, was the killings of fellow students at Columbine High School by three youth from economically well-endowed families and communities that were unaware of the threat within.

Domains of Human Development and Competence

Social science research with youth often lacks both cultural understandings (see Lee et al., 2003) and awareness of the *affective* component in cognitive functioning generally (e.g., see DeCharms, 1968) and social competence formation specifically (i.e., effectance motivation; R. White, 1959, 1960). The shortcomings are evident both in the design and the interpretation of scholarship on youth of color. Similarly, a general oversight of cultural inclusiveness, including *lived privilege as culture* as experienced by White youth, is lacking. Minority children and adolescents developing in contexts defined by a unique family structure and sets of cultural practices are (a) generally *not well* understood, (b) behaviorally misinterpreted, (c) burdened with demonizing assumptions, and (d) frequently absent from developmental science concerned with normative human processes. The oversights have implications for schooling experiences (i.e., both for the training of teaching and administrative professionals), and the general context-linked socialization experiences of relevance for competence formation and human development more broadly. To sum, conceptually inclusive approaches to developmental science have important societal implications regarding how policies are framed and implemented, how contexts are structured, and how socializing adults (e.g., teachers, administrators, and service providers) actually deliver the supports intended for youth of color. Good science representative of the breadth of human experiences facilitates the best practices and policies. Accordingly, needed are viable and

broadly inclusive approaches to child development for use in maximizing the best possible youth outcomes.

Need for Inclusive Approaches to Human Development

Particularly during childhood and adolescence, exposure to social factors experienced as challenges (e.g., social stigma)—particularly those creating *bias* (i.e., whether inferred collectively by the group or experienced individually)—are important. Further, they have explanatory relevance for interpreting individuals' stage-specific outcomes. For example, the function and experience of negative teacher perceptions experienced by youth help explain performance disparities documented both between and within diverse groups (see Spencer, 1999a; Spencer & Harpalani, under review; Steele, 1997). For a significant length of time, inferences about teachers have aided the interpretation of gender differences in achievement findings for European American students (see Dweck, 1978). Dweck's research findings suggest that in the primary grades, European American female students tend to internalize failure and externalize success. The opposite pattern has been observed for elementary school boys who learn early on to internalize success and externalize failure. The findings are in keeping with observations that boys and girls have very different school experiences (Irvine, 1988).

Because elementary teachers are often female, Dweck's (1978) findings suggest that female teachers may be more accurate when anticipating and evaluating the behaviors of girls. Alternatively, boys tend to learn that elementary school teachers are in error at least half of the time when providing evaluative feedback to them. Dweck (1978) suggests that boys compensate by "discounting" the feedback and "celebrating" their successes by crediting only themselves. However, although not included in her study, other conceptual analyses would suggest a quite different pattern if investigating the experiences of male youth of color (see Irvine, 1988). These youngsters have the *added task* of sorting out the contribution of teachers' racial attitudes and bias that become intertwined with academic evaluation and behavioral feedback. Minus a few exceptions (e.g., Dweck, 1978; Ladson-Billings, 1994), student characteristics as linked with feedback patterns, unfortunately, are infrequently and not seriously considered as part of the context for evaluating the competence and character of youths' social relations.

Inferred or intended bias may serve both conscious and unconscious roles in human relations. Bias represents frequently unacknowledged adverse beliefs about particular individuals and is often experienced as the invisible elephant in the room in that it potentially creates extreme *emotional discomfort.* The emotional response may be apparent and different for those either recognizing its presence or feigning its absence. Importantly, as described by Chestang (1972), in either case, the emotional reaction to the experience potentially compromises stage-specific character formation (i.e., as either specifically patterned behavioral responses or developmental processes more generally). In many ways, given gradually emerging cognitive schemas beginning at infancy, the emotional response may be not unlike the experience of marasmus (failure to thrive syndrome). For infants, this syndrome suggests an expressive response to inadequate emotional or physical care. Alternatively, when applied to the experience of adults with highly vulnerable infants, Kennell, Trause, and Klaus (1975) have described the difficulties encountered in emotionally bonding with infants deemed terminally ill and not expected to survive; in such cases, interventions are needed for maximizing infant-caregiver bonding. Accordingly, when considering social relations between and among adults and children, the presence of bias may not only serve as a source of negative stereotyping and shame for some but also, as described by McIntosh (1989), may afford disproportionate protective factors (i.e., conceptualized as privilege) for others. Thus, barring a few exceptions (e.g., Spencer, Brookins, & Allen, 1985), the dilemmas of *individual-context consonance* for some (e.g., the privileging experiences afforded some European American youth) and the psychological experience of *social dissonance* for others (i.e., more often than not, experiences of youths of color; see Chestang, 1972) are not equivalent. The conundrum remains inadequately integrated and considered in psychology's mainstream journals and for most theorizing about human development particularly for diverse youth, specifically those of color (see Spencer, 1999). This conceptual shortcoming (i.e., of interpretation and ultimate planned support as social policy and innovative program design) has implications for generalized human development enhancement, basic human rights infractions, and social justice. Specifically, when describing diverse populations, the oversight has salient implications for the design of precise policy, the

incentive structure in support of best practices, the interpretations made of evaluation study outcomes, the character and process of juvenile justice system-based experiences and consequences, and decision-making processes about basic programs of research to be supported (e.g., the actual types and sets of questions posed). The specific points of view espoused in this chapter support greater *conceptual inclusiveness* that goes beyond the mere inclusion of diverse samples in a study's design or program of research. As suggested, good human development theorizing representing real time and valid human development experiences of diverse groups and their members serves important interpretational and decision-making functions. As a strategy, it impacts the quality of child development and youth outcomes through implicit *social engineering as social policy.* Such a strategy provides ways of articulating challenges and specifying precise supports required for facilitating best practices (i.e., as policy and application) while at the same time altering deleterious contexts that interfere with the promotion of productive coping methods, which maximize the various expressions of positive youth outcomes as reactive coping practices and stable healthy identities.

Particularly for highly stigmatized groups, within-group variation is seldom acknowledged and, instead, homogeneity is often assumed. In contrast, between-group differences frequently serve to further marginalize or stigmatize outliers (i.e., those performing significantly outside the mean). The sources of variability observed both within and between groups are broad and may be due to multiple human characteristics or contextual experiences that operate as processes and mediate between an individual's vulnerability level and stage-specific coping outcome. For example, high performance associated with privilege may be a valid explanation for some; alternatively, high performance for youth of color may be due to significant levels of adaptive coping and resilience. The implications of each may be different when individuals of each type are confronted with similar challenges *and equivalent supports.* Resilient youth may get better scaffolding from extra supports, already have a history of dealing with challenges, and thus, possess well-developed coping skills. However, the same level of challenge for privileged youth may be more disconcerting than expected because a history of privileging experiences would not afford similar opportunities for the developing of multiple coping strategies. Similarly, responses to a standard level of support may be different as a function of privileged individuals' level of personal vulnerability, which, historically, may not have been an issue if maximized support had remained the standard. However, with the standard of support, perhaps, being lowered to a level different from individual history, individual vulnerability characteristics might provide ways of explaining expected differences. Discussion and exploration of such within-group variation is infrequently addressed for Caucasian youth. Variation of responses to challenge for youth of color is generally not sought and perhaps is undermined by the very design of research studies (e.g., given the frequent comparison of middle-income European American youth with low-income youth of color).

Accordingly, when considering either within- or between-group differences, an individual's accrued vulnerability represents the balance between risks and available protective factors. On the one hand, risk types have implications for the character of challenges that one experiences or anticipates. On the other hand, protective factors may vary, ranging from the intergenerational sharing of cultural traditions to unusually high levels of accumulated wealth. Obviously, both would demonstrate different manifestations as each serves as a source of support. Further, it is important to acknowledge that both types of protective factors (e.g., cultural socialization versus intergenerational transmitted accumulated wealth) have important implications for both the specific *nature* of anticipated supports available and their character (e.g., stability and persistency or internal versus external origin).

Risks and protective factors may take a variety of forms given variations in race/ethnicity, gender, faith community, body type, immigration status, skin color, privilege, health quality or disability status, cultural traditions, social class, and temperament. All are linked to the character of the context and the individual's history of experiences and even the group's history in the nation (e.g., generational experiences of immigrants as newcomers and long-term adaptations of indigeneous groups such as Native Americans, Hispanic, and African American youth and families). When experienced as challenges or supports, the sources of variation within or between groups may be biologically inherent (e.g., due to the heritability of temperament, skin color, or body type) or socially constructed (e.g., beliefs and biases concerning race/ethnicity, social class, and physical attractiveness). When considered together, as suggested, the noted basis of variation represents potential sources of *risk* or *protec-*

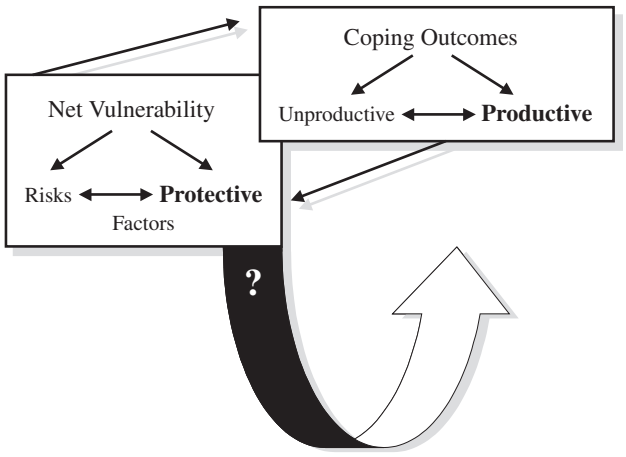


Figure 15.4 Non-deterministic theorizing: Acknowledges intervening mediating/moderating processes thus illustrating potentially diverse outcomes given unique individual-context-process interactions.

tion that are associated with some level of human vulnerability. The actual character of individual vulnerability is unavoidably associated with the nature of the context and its provision of either excessive challenges or supports. The level of vulnerability has implications for achieving stage-specific manifested competence (White, 1959, 1960), resiliency (Anthony, 1974, 1987; Luthar, 2003), or under-development. In addition, and as described in Figure 15.4 as an example of nondeterministic theorizing, generally ignored or inadequately recognized (i.e., particularly as it relates to child development and adolescent experiences) is an emphasis and acknowledgment of the individual's awareness of (cognition-dependent) perceptions and stage-specific meaning-making processes.

Mediating Processes between Vulnerability and Coping Outcomes

From our conceptual perspective (as illustrated in Figure 15.4), we hypothesize that intervening processes between vulnerability level and coping outcomes go beyond an understanding of the "what" of the individual-context relationship. A focus on the mediating processes aids in explaining the "how" of development (Spencer & Harpalani, 2004), not merely the "what," as eloquently illustrated by Bronfenbrenner's model (Bronfenbrenner, 1989). Individuals' awareness of (cognition-dependent) perceptions and stage-specific meaning-making processes afford the consideration of critical inferences salient for understanding youths' coping and identity-formation processes. Further, it is the socially linked and maturation-based variability of youths' cognition dependent perceptions that supports the acquisition of unavoidable awareness of their own (i.e., assumed internal states) and *social others'* perspectives. For example, research on children's awareness of race as a social category (i.e., understandings or knowledge about race) assessed frequently as racial attitudes and preference behavior demonstrate the complexity of youthful meaning-making when cognition-dependent awareness is also considered (e.g., see Spencer, 1982, 1983, 1985; Spencer & Markstrom-Adams, 1990). Specifically, the insight affords greater understanding about the *unfolding processes of child and adolescent* cognitive, social, and affective *capacities* when linked with context-linked challenges (e.g., race biased treatment), given varying degrees of human vulnerability (i.e., countless levels of race-associated contextual risks versus privilege-associated, Caucasian-linked protective factors). Characteristics of the context observed as numerous patterns of stable conditions and the inferred meanings made about them are not lost on youth. Accordingly, PVEST as a context-linked systems framework goes beyond merely linking human vulnerability (i.e., risk considered against protective factors) linearly and deterministically with stage-specific coping products. Moreover, when considering stage-specific developmental tasks that are experienced as challenges, the framework also acknowledges and specifies the breadth of available supports possible; at the same time, it recognizes the role of supports for productive stage-specific coping products (see Figure 15.5).

The framework also focuses on the mediating/moderating function of net-stress responses and

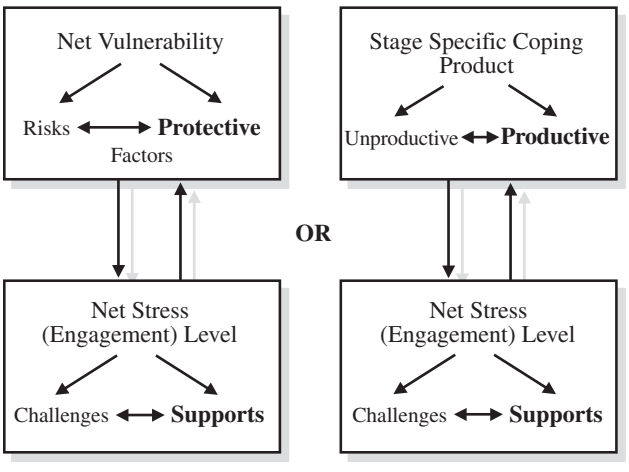


Figure 15.5 Stress-focusing research exemplars: Stress conditions may link with either individual vulnerability level or stage-specific coping outcomes.

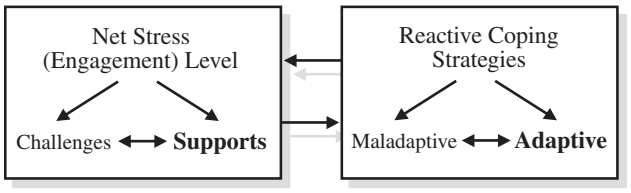


Figure 15.6 Stress and coping links: Emphasizes linkages between reactive coping methods and net level of stress experienced.

reactive coping styles available through a history of socialization (see Figure 15.6), and, consistent with ego psychology theorizing by Erikson (1959), it bears in mind the critical function of emergent, stable, identity-formation processes (see Figure 15.7).

The three mediating processes were illustrated previously and collectively (see Figure 15.4) and depicted as a large question mark and thick arrow between vulnerability and stage-specific coping outcome. The mediating processes assist with explanations about the diversity of individual-context-process mediated links. These associative relations provide the reason for a simultaneous consideration of structural factors, cultural influences, individuals' perceptual processes about the self, bidirectional interactions with others, and myriad daily life experiences that impact individual vulnerability, productive coping outcomes, and, for some, manifested resiliency. The perceptions and patterned responses occur as individuals confront normative developmental tasks while navigating countless contexts in pursuit of demonstrating competence given the unavoidable impact of effectance motivation (R. White, 1959, 1960). Accordingly, given both between- and within-group variations for diverse individuals and associated contextual heterogeneity, the resulting person-context-processes system of mediating/moderating effects may vary. As depicted in Figure 15.5, it is interesting that the literature often narrowly focuses stress questions (i.e., balances between challenges and supports) around vulnerability themes for some groups (e.g., European Americans) while it provides a stress focus as linked to outcomes of competence or failure for others (e.g., diverse youth of color). We suggest that the approach taken often varies by ethnicity. For example, being African American or poor is frequently linked with studies of stress for Blacks. Although divorce as a significant stressor is often linked with particular coping outcomes for European Americans (refer to Figure 15.5), the level of support provided by privilege as experienced by European American youth has just recently become the focus of rigorous developmental science efforts concerned with maladaptive coping (see Luthar, 2003; Figure 15.6).

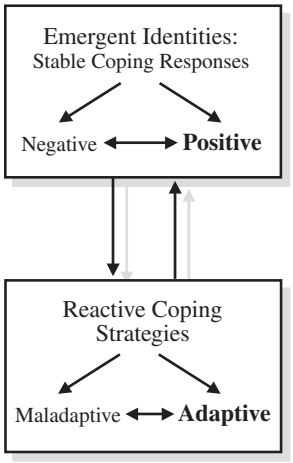


Figure 15.7 Identity-emphasizing research.

Consistent with the emphases described and theorized by Cross (1991) and Erikson (1959) about reference group orientation and broad ego processes, respectively, the multiple functions of *identity processes* are foundational to this framework. Specifically, the central placement of identity processes is evident through its mediating links between human coping (i.e., net reactive coping) with broad ego processes (i.e., stable emergent identities; see Spencer, 1985; Spencer & Dornbusch, 1990; Spencer & Markstrom-Adams, 1990; Swanson, Spencer, & Petersen, 1998).

The central role of identity and self processes affords the framework an ICE (identity-focused cultural ecological) perspective, given the important and implicit function of social cognition, perceptual processes, and context character (e.g., Spencer, 1984, 1985). As described in Figure 15.7, negative identity processes for youth of color have been assumed to be a reactive coping response to racial group membership; the relationship is frequently assumed particularly for African American youngsters. However, the assumptions have not been confirmed with empirical data (see Hare & Castenell, 1985; Spencer & Dornbusch, 1990; Spencer & Markstrom-Adams, 1990). Beginning with the work of theorists such as Kardiner and Ovesey (1951) and Pettigrew (1964) and as inferred from the *Brown v. Board of Education* decision (i.e., as in the citations of Kenneth and Mamie Clarks' research as cited in Cross, 1991), the

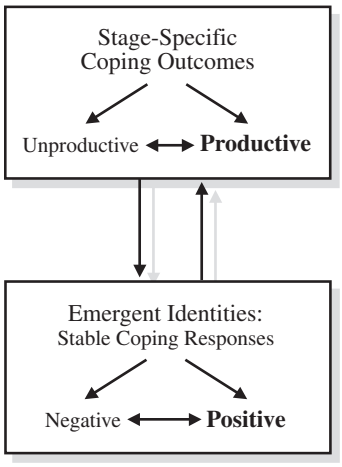


Figure 15.8 Outcome- and identity-emphasizing theorizing: Approach narrowly focuses on specific life stage coping outcomes and makes assumptions about identity character.

consistent assumption of psychopathology and negative identity processes continue to be associated with assumed internalized risk related to the stigma associated with skin color and identifiability (i.e., and implications for biased treatment; see Figures 15.8 and 15.9; Cross, 1991, for a review).

It is interesting that identity processes for African American youth are not more carefully analyzed and interpreted given their often co-occurrence with appearances of unproductive stage-specific coping outcomes (e.g., school failure). The *lack of anticipated (i.e., negative) linkage* between self concept and unproductive outcomes is due to the not unexpected and greater salience of *own-group significant others* for children's psychological functioning and well-being. In other words,

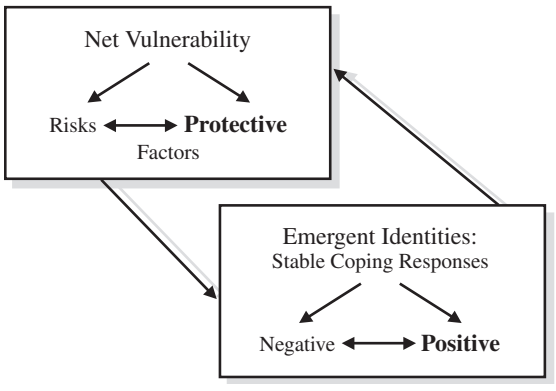


Figure 15.9 Identity- and vulnerability-focusing approaches: Perspective focuses mainly on individual vulnerability associated with speculated identity statuses.

youths' own families, friends, neighbors, and extended kin represent the *comparison others* of salience for social emotional functioning (i.e., inferred self valuing is reflected from *referent others*) rather than externally and negatively evaluated life-stage specific outcomes.

As particularly applied to youth of color, process-oriented theorizing is needed that acknowledges context and, at the same time, demonstrates mediating processes and avoids the conceptual assumptions and erroneous conclusions of the past. Finally, unlike many theories of human development that merely mention context and acknowledge processes, our conceptual approach more specifically and directly demonstrates the person-context-process view as espoused by Bronfenbrenner (1985, 1989). PVEST provides insights about the "how" of development (see Spencer & Harpalani, 2004), and, we believe, more directly links the daily experiences of diverse people given individual characteristics and protective factors (i.e., by ethnicity, race, social status, religious faith, and physical attributes—skin color or body type) with environmental quality (including the availability of supports and challenges) as individuals traverse multiple contexts. Specifically, successful transitions require good person-context fit for maximizing human processes and behavioral outcomes (see Matute-Bianchi, 1986; Spencer & Harpalani, 2004). An approach of this type aids in interpreting the "how" or "why not" of youth outcomes as promulgated by positive youth development theorists included in this set of volumes such as Benson (Benson, Scales, Hamilton, & Sesma, Chapter 16, this *Handbook,* this volume) and Lerner (Chapter 1, this *Handbook,* this volume). The broad, dynamic, developmental, identity-focused, and context-linked perspective suggested by PVEST and relevant to numerous groups, to date, has not characterized approaches to child and adolescent development nor life course theorizing (see Spencer, 1999; Swanson & Spencer, 1999; Swanson et al., 1998).

Summary

In summary, this chapter's organization was structured to delineate the advantages and contributions of PVEST for maximizing the applicability of human development theorizing for many ethnicities or diverse groups of humans (both youth of color and European Americans). The first section indicated the chapter's focus on the period of preschool through adolescence and explained why the theory affords human development a life-course

and identity-focused perspective that highlights cultural patterns as linked to context character. The next section afforded a detailed introduction to the PVEST framework, and was followed by a discussion of the framework's useful dynamic character. Several cross-cutting themes of human development were used for illustrating the connectedness between individual characteristics and context interactions, thus, providing a mechanisms for interpreting nuanced cultural patterns. *Brown v. Board of Education* was introduced as relevant for highlighting and demonstrating the impact of policy change and its role in determining long-term youth experiences and schooling. The next two text divisions introduce final sections that indicate the distinct interpretational advantages of the framework.

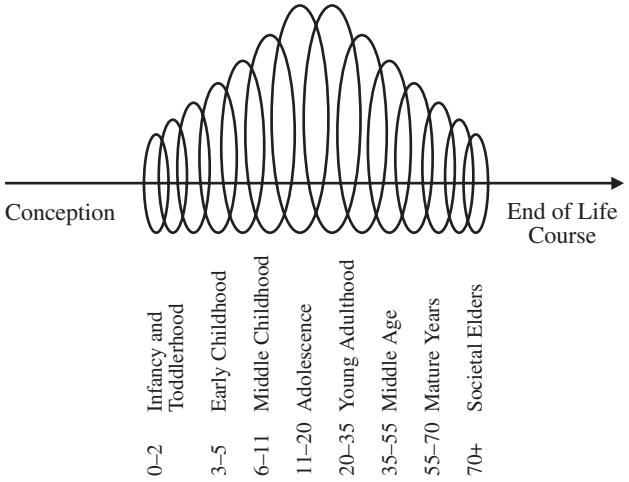


Figure 15.10 Spiraling and interactive systemic processes: An assumed "unfolding" of human processes occurs across the life course from conception to death.

PHENOMENOLOGICAL VARIANT OF ECOLOGICAL SYSTEMS THEORY: MULTIDISCIPLINARY, DYNAMIC, SYSTEMIC INFLUENCES, AND PROCESSES OF A SYNTHESIZED RECURSIVE FRAMEWORK

The meaning-making that individuals formulate about their lives evolves from basic social and cognitive development processes. These formulations become more sophisticated with broadened social experiences and increases in cognitive maturation (Flavell, 1968; Spencer, 1982, 1983, 1985; Spencer & Markstrom-Adams, 1990). These relationships are better understood both from a dynamic framework that crosses interdisciplinary boundaries (e.g., individual and group experience, biological foundations, and cultural traditions), one that is indelibly linked to contextual forces, and from a perspective that includes recognition of individuals' information processing efforts available and reflecting the opportunities and constraints of the various developmental periods.

The Foundational Role of Social Cognition and Linkages to Phenomenology: Inference-Making, Perceptions, and Youths' Everyday Experiences

More recent theorizing about children's theory of mind adds to our understanding about recursive and development-dependent processes (Frye, 1992; Frye & Moore, 1991; Nguyen & Frye, 1999). We've learned that the character of these recursive processes have implications for more general competence as lives unfold across the life course (see Figure 15.10), and, as sources of social feedback, the social environment represents an unavoidable and critical component of this process (see Figure 15.11).

From the earliest interactions between infants and parenting adults, feedback impacts children's behavior on the environment and a reverse interaction occurs as well (or consider the lack of feedback and the sequelae of minimally responsive babies as described by Kennell, Trause, & Klaus, 1975). Infants' cognitive awareness was described by Piaget (1926, 1967) as evolving schemata. At the same time, early ego functioning was the subject of theories by Erikson (1968) and others as

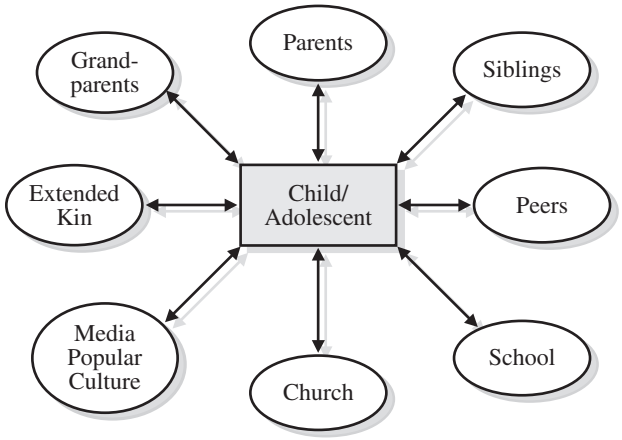


Figure 15.11 Bidirectional influences of significant others on youths' development.

not independent of cognitive development. Both domains are involved in critically important personifications or early self processes of human functioning. These linked processes occur simultaneously in social contexts and serve critical roles for life-course development. Independent of the domain stressed or the theoretical approach to which one subscribes, the salient implications of social feedback for the development of general competence as defined by R. White (1959, 1960) is apparent. Children's successful use of cognition-dependent social cues reinforce and support effective management of the environment and demonstration of stage-specific competence. Given this recursive process, the feedback concerning a successful impact on the environment has implications for subsequent efforts expended and is described by R. White as "effectance motivation." Thus, as suggested by Figures 15.10 and 15.11, socializing adults and others are critically important for these bidirectional processes.

Social Cognition and Development

Unavoidable inferences made from experiences may be linked to individuals' meaning-making processes. They include the (a) perception of challenges and available resources; (b) exposure to modeled strategies for reactive coping, and (c) character of self processes inferred and enacted, which then contribute to stable emergent identity processes. Following this line of thought, individuals' life-stage specific coping products (i.e., as a consequence of a stable identity providing consistency in coping responses over time and place) are linked to context character and which have societal implications as outcomes for what Damon (2002) refers to as either noble versus ignoble "deeds." We suggest that the processes frequently overlooked are imbedded in contexts that vary by risk level and the availability of protective factors that make accessible specific types of supports. To illustrate, a priori assumptions imposed from the outside *matter* and overlap with youths' unfolding sense of purpose (e.g., the media's characterization of particular youth as deviant or delinquent, while ignoring the wrong doing or immature behavior of others, reinforces assumptions of privilege for some and pathology for others). Risk level also matters as it is associated with our human and unavoidable inference-making processes (i.e., social perceptions). Both the unavoidable cognition-linked perceptual processes and a priori context-associated risk factors make a difference for self processes (e.g., Spencer, 1981a, 1981b). Experienced as stigma, underanalyzed, or unsubstantiated assumptions may contribute as core features to context character for some (e.g., underresourced housing and more general neighborhood conditions) and, as stereotypes, produce additional risk that compromise self processes.

Self Processes of Diverse Youth

The ecology of youth development may take on a particularly troubling hue when examined for culturally marginalized or diverse youth of color (e.g., Chestang, 1972). Youths' knowledge of or inferences about the world have important implications for psychosocial functioning. As applied to the experiences of youth of color, epistemology is seldom a concern in the literature. Epistemology is a branch of philosophy concerned with the nature of knowledge (see Piaget, as reviewed in Hergenhahn & Olsen, 1993, p. 275). Relative to patterns of achievement and minority status issues, the acting White inferences from particular ethnographic assumptions and analyses (e.g., Fordham & Ogbu, 1986) provide an example. Although theoretically critiqued (e.g., Spencer et al., 2001; Spencer & Harpalani, under review) and empirically demonstrated as incomplete (e.g., see Steele & Aronson, 1995), the negative impact of the achievement-linked stigma on the ecology of learning and development particularly for African American youth is both unfortunate and undeniable. Specifically, unwarranted stigma makes it difficult for adolescents to engage in positive character formation given that the process is attempted under what Chestang (1972) describes as "hostile conditions" (see also, e.g., Phelan, Davidson, & Cao, 1991). Further, when applied to the context-associated experiences of African American youth, correlates of stigma can contribute to youth feeling "missed, dissed, and pissed," as described by Stevenson (1997).

Social science has always benefited from analyses that provide perspectives of others outside the person. However, we restate that a systems-oriented analysis that acknowledges the critical and ever-present role of the person's own *phenomenology* or unique set of perceptions is also needed. This perspective affords an often-ignored or assumed analysis of the individual-context interface and, consequently, *context and culturally linked behavioral response.* As suggested, the latter is particularly salient because it is inherently ecological and represents the character of experiences associated with a particular context. Claude Steele and his

colleagues' excellent illustrations provide an effective vehicle for explaining achievement behavior and school orientation of a long-term stigmatized group who the media would infer lack a sense of purpose: African American students (e.g., Steele & Aronson, 1995).

Because youths' own perceptions of social contexts (both past and present) and unique level of individual vulnerability coexist, it is not unexpected that associated net-level experiences of stress vary *and matter*. The noted associations are seldom acknowledged, accounted for in the design of programs of research, or directly measured. Further, these themes are not considered in a culturally sensitive, contextually linked, or developmentally framed perspective. Considered together, the shortsightedness considerably narrows the view of sense of purpose and suggests a false dichotomy of noble versus ignoble purpose as expressed behavior (see Spencer, Fegley, & Harpalani, 2003). Efforts that represent noble efforts in the face of great adversity are generally unacknowledged, not recognized, or undervalued, given traditional assumptions concerning representations of sense of purpose. Erroneously inferring a lack of purpose is more probable than not for youth of color or those from low-resource communities. Their attempts at orientation toward right action (see Spencer, 1999a) is frequently hampered by very challenging contexts and circumstances (e.g., the multiple opportunities for adverse profiling by police officers, social experiences in peer groups are generally viewed as suggesting gang membership, driving or riding in motor vehicles are frequently assumed to be drug vans). Most important, European Americans of diverse groups do not generally encounter similar stigma; most youth enjoy the privileges associated with innocent forays and youthful experiences associated with suburban and affluent communities without attendant and persistent concerns about harassment based solely on race, ethnicity, class, faith community, national origin, or skin color. Contrary to European Americans' experiences and as encouraged by Erikson (1968), diverse youth of color are not provided opportunities for social experimentation without significant consequences and personal risks.

As indicated, we view an ICE perspective (Spencer, 1995; Spencer et al., 2006) as a theoretical framework of human development that is inclusive of culturally diverse youths' potential breadth of experiences and normative identity needs. Given the countless developmental trajectories possible, unavoidably youngsters infer supports, cope reactively with adversity in the moment (see Stevenson, 1997), and internalize emergent identities that have implications for stage-specific coping outcomes. Particularly for African American and Hispanic youths, their social experiences along with an evolving sense of purpose may be highly stigmatizing and compromising to the latter. For that reason, we view the theory-driven analysis proposed as a source of protection against the continuing penchant to misinterpret youthful efforts for demonstrating a sense of competence or achieving a sense of purpose albeit frequently under unacknowledged difficult circumstances traditionally ignored in developmental science specifically and the social science more generally.

Thus, PVEST utilizes an ICE perspective, integrating issues of culture, social and historical context, and normative developmental processes involved in identity formation and broad psychosocial processes (see Dupree, Spencer, & Bell, 1997; Spencer, 1995; Spencer & Harpalani, 2004; Spencer, Hartmann, & Dupree, 1997). While Scarr (1988) correctly argues that "the phenomenology of experiences is . . . correlated with the genotype of the individual perceiver and processor" (quoted on p. 241), we believe that this view is far too unsophisticated; in the mold of much of the behavioral genetics research we have reviewed, it is an accurate but oversimplified statement (see Spencer & Harpalani, 2004). We submit that *delineating the processes* involved, rather than a mere statement of obvious correlation, is necessary for an understanding of nature-nurture interaction in human development. A fuller understanding of process and context is necessary to understand how the genotype impacts development. We treat the genotype similarly to Bronfenbrenner's, as it is an important and influential aspect in human development, but the *expression of the genotype* in context is actually a component of the developmental system.

Phenomenology and Context Character

The PVEST framework combines a phenomenological perspective with Bronfenbrenner's ecological systems theory (1989), linking context and perception. The critical role of phenomenology, among others of the period, may be best represented by the personality theorizing of Carl Rogers who described the perspective during the first half of the twentieth century (e.g., see Schultz, 1976). In combining ecological perspectives with phe-

nomenology, the integration provides an analytical mechanism for understanding the individual's meaning-making processes that underlie identity development and coping outcomes (Spencer, 1995; Spencer, Dupree, et al., 1997). PVEST serves as a model to examine normative human development—framed through the interaction of identity, culture, and experience (given a particular psycho-historical moment)—in fact, the systems framework is *apropos to individuals of all ethnicities and operates as a set of recursive processes throughout the life course.* As suggested, PVEST utilizes an ICE perspective, integrating issues of cultural context with normative developmental processes. Each component represents part of a system that is nestled in the multiple levels of youths' contextual experiences.

Systems Framework in an Ecological System

As described, the framework acknowledges the critical role of *perceptions* (Spencer, 1995) and focuses on identity formation while considering macro-, exo- and mesolevel structural factors, cultural influences, individual perceptions of the self, significant others, life experiences, and the environments in which individuals live and function. Identity formation takes place across the life course and is especially relevant for adolescents given their heightened self-consciousness. PVEST combines this emphasis on individual perceptions with Bronfenbrenner's ecological systems theory (1979), thus linking context and perception. Consistent with classic ecological psychologists, Bronfenbrenner's model provides a means for describing how multiple levels of context can influence individual development; additionally, PVEST directly illustrates life-course human development *within* context. In doing so, it allows an analysis of the meaning-making processes that underlie *identity development* and behavioral outcomes (Spencer, 1995, 1999a; Spencer, Dupree, & Hartmann, 1997). This is important because, as reviewed earlier, most theories of development assume a priori deviance and psychopathology for highly vulnerable populations; yet they *cannot explain* diverse outcomes for individuals in shared *contexts* (e.g., siblings' development in the same family, neighborhood, and socioeconomic status often manifest different life-stage outcomes—one sibling graduated from secondary school versus the other incarcerated in a juvenile facility).

Illustrated as a recursive system in Figure 15.12, the PVEST framework consists of five basic components that form a dynamic theoretical arrangement.

The first component, *Net Vulnerability Level (1),* consists of individual, family, and community characteristics that may serve as risk versus protective factors (or both if considered at different developmental periods) during an individual's development. *Net* Vulnerability Level is so described because risks usually do not exist without some protective factors: Accordingly, the effects of apparent risks may be offset or balanced by the presence or availability of protective factors (e.g., privilege group membership, a particular cultural socialization history, skin color, facial features, body type, intellectual superiority, attractiveness, economic stability, well-educated parents and protective extended family networks, emotionally available and caring adults or nonrelated kin, and an individual's personal history of productive coping during a *prior period of stage-specific outcomes*). We suggest that a net balance between evident risk factors and accessible protective factors defines an individual's net vulnerability level for a particular period. The content and character of the protective characteristics available at one stage (e.g., middle childhood) may not remain adequate enough, without additions, when traversing another stage (e.g., adolescence). Particularly for marginalized youth (e.g., youth of color, immigrants, and low-resource youths), identified risk factors may include socioeconomic conditions, such as living in poverty, and imposed expectations based on race, immigration status, unstable family economic status, and gender stereotypes.

As illustrated in Figure 15.12, the bidirectional arrow of the Net Vulnerability Level indicates an unavoidable linkage between risks and protective factors and suggests a particular level of vulnerability. The transactional and dynamic relationship between risks and protective factors is apparent at different developmental stages as lives unfold with increasing complexity over time. The balance between risks and protective factors and consequent level of vulnerability evokes a particular psychosocial status that can produce either worse or improved conditions dependent on or due to prior or attendant experiences. Most important, as individuals transition across time and place, net vulnerability is itself recursively linked to its transformation as everyday stress processes for individuals as each interfaces with multiple environments of varying character.

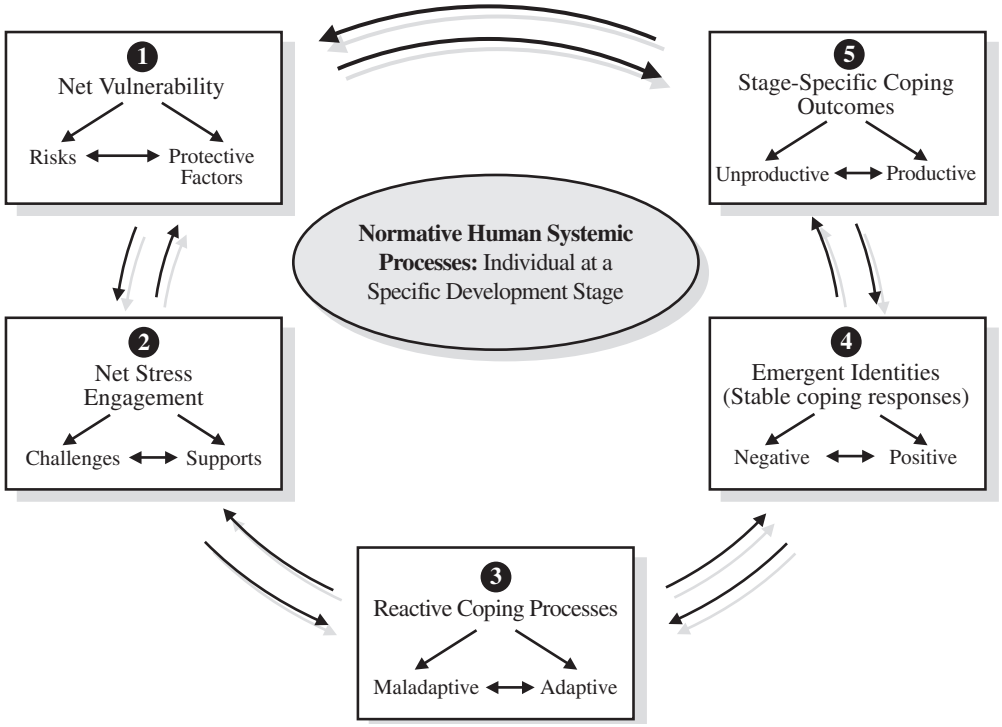


Figure 15.12 Phenomenological Variant of Ecological Systems Theory (PVEST): Revised (2004) Process Emphasizing Version.

The second component of PVEST, *Net Stress Engagement (2),* refers to the actual experiences of challenge and support that can impinge on an individual's well-being. In contrast to the risk factors referred to in the Net Vulnerability Level, stressors are *actualized risks encountered* that require some level of response because they are experienced as specific challenges. Net Stress Engagement is recursively linked with Net Vulnerability Level, and represents the balance between challenges actually encountered and available supports accessible or available. Challenges and supports may be physically experienced or symbolically assessed and their significance inferred (e.g., assumptions about privilege expected and supports available or perceptions about tests or confrontations to be weathered).

Again, Steele (2004) describes the impact of identity or social stigma on performance outcomes. He describes the inferred meaning of a stigma's content that an individual may make (i.e., experienced as some level of challenge) concerning the character of the performance "expected"; the social experiments by Steele and his colleagues suggest that the effect can be nullified or its impact diminished by specific supports provided or through the reframing of expectations. The nature of the "balance achieved" (net stress level experienced) has implications for an individual's state of psychological well-being. Thus, given the media-hyped stigma associated with the achievement gap for African American youth (e.g., high achievement's hypothesized association with acting White beliefs or expectations for low performance), the ways in which an achievement test situation or other evaluative setting (e.g., work site) is framed or inferences about personal performance are communicated may represent significant sources of psychological challenge or fuel assumptions about inherent support possible (see Spencer & Harpalani, under review). What is interesting about the character and use of stigma is that it represents a social construction experienced in particular and nonequivalent ways across groups. For example, Lesser and Stodolsky (1967, 1970) describe the superior performance of Jewish Americans over Caucasians and all other groups. However, the high achievement efforts of other groups have never been described as "acting Jewish." Similarly, when considering the high performance of Asian American students when compared with Caucasians, Hispanics, and African Americans, it remains curious that only African American youths' high achievement behavior is described as acting White. African American performance disparities are usually associated with deficit characteristics of

self or the group although the lower performance of Caucasians when compared with Jewish children is never adversely depicted in parallel ways. Considering the appearance of particularly structured, widely circulated, and socially constructed media images for subgroups of marginalized youth, it is not surprising that the cultural socialization literature (see Arrington, 2002; Slaughter & Johnson, 1988; Spencer, 1983, 1990) provides detailed illustrations of how culturally specific strategies serve as exact types of *support* for precise diverse group members. Jackson, Boostrom, and Hansen (1993) suggest a group of positive qualities or virtues that individuals occupying particular systems possess, or contexts themselves exhibit (e.g., teachers, students, or classrooms), which maximize the probability of finding positive virtues. They suggest that the best strategy for accomplishing this "is by adopting and maintaining a sympathetic outlook, by going about the task biased in the direction of making positive errors, of seeing virtues where they are not, rather than the other way around. . . . For many of the positive qualities of teachers, students, and classrooms are subtly expressed and are visible to those who look closely and who do so with a sympathetic eye" (Jackson, Boostrom, & Hansen, p. 258). The unfortunate dilemma for marginalized youngsters is that the process described for seeing positively about others is usually reserved for those who enjoy a privileged status. Thus, diverse students also receive *ranges of feedback* about their status and inferred social station, which is not independent of the protective factors available and contributes to youths' level of net vulnerability (i.e., first component of PVEST).

As suggested, accessible or available social supports are transformed protective factors described as the first component of PVEST. They aid youths' transitioning through challenging experiences thus serving to reduce or offset the net level of stress experienced. In many ways, supports are actualized protective factors. Whereas risks and protective factors denote demographics or descriptors relevant to individuals, family members, or community, *net stress* level is the balance between *challenges and support.* The character or quality of balance suggests the *actual phenomenological experiences of risk and protection in context.* For example, the addition of an adult male to a household may act as either a stress or a support depending on the context and, perhaps, the gender or parentage of the offspring in question. A single mother may marry the biological father of one of her children. The introduction of an adult male into the family may be perceived as a source of significant support by the mother and other family members, particularly if he adds significant economic resources to the household. However, the presence of this new adult male may be perceived differently by adolescent children in the household who are not biologically related to this new adult male and his intended role as a source of support. For example, an adolescent male may perceive this new presence as a loss of his own perceived role as the man of the house; the source of support may be actually inferred as a serious threat to the male youth's inferred status or his very identity.

The scenario may evolve differently for adolescent females who look to inferred safe adult males for feedback to reaffirm femininity and other aspects of gender identity. However, as a nonbiologically linked male, the mother's husband may or may not have the appropriate understandings about the daughter's intent or need for specific and safe feedback. The adult male may (mis)interpret the girl's efforts as a hyper-sexualized display. He may not understand the *teen's actual interest in obtaining affirmation for her femininity.* The transactional outcomes from interactions with her mother's spouse may serve to increase the girl's risk due to increase challenges encountered in interactions with her mother. The girl's mother may view her daughter's behavior as sexually alluring versus the girl's actual intent (i.e., to evoke feedback for the purpose of promoting psychosexual development).

Alternatively, as a second scenario, for youth developing in households burdened with economic insecurity, a mother's need to obtain work for maintaining the household economy might invite greater stress due to expectations for shared household responsibilities. Privileged youth unfamiliar with the strategies for successfully coping with schoolwork and, at the same time, contributing to household chores might find it difficult to adjust to a change in lifestyle when a family is confronted with sudden economic downturns and attendant stressors; a youth from a privileged family history may have less time to hone the necessary skills for accommodating the new family stresses and attendant required role expansions. Having to cope with the noted role challenges concomitantly with traditional peer expectations and new family constraints may potentially increase overall level of stress experienced in the moment when confronted by associated challenges (e.g., cooking, cleaning, or child care responsibilities for a younger sibling). It is not only the balance between the

current challenges, given accessible supports that impact overall stress, but also the recursive links with net vulnerability because the family situation is increasing its level of effective risks with potential changes in its ability to maintain the prior protective factors. In sum, given the recursive links between net vulnerability evolving and net-stress level currently experienced, youth may respond by adopting an in-the-moment reactive coping response.

In response to the challenges noted and in conjunction with available supports, the net level of stress experienced requires that the third component, *Reactive Coping Methods (3),* is deployed. Figure 15.12 illustrates that reactive coping responses include problem-solving strategies that can be either adaptive or maladaptive. For instance, given the prior illustration, in response to decreased time and attention from parents and the need for adolescents to take on more familial responsibilities, youth may engage in more risk taking behavior (a maladaptive response) or seek more support through greater interaction with extended kin (e.g., grandparents) and non-kin adults (e.g., school counselor, teacher, or religious leader). Accordingly, there will be options for positive or adaptive responses when particular issues surface in peer contexts, the family system, or with social institutions such as schools. Conversely, models of maladaptive problem solving would also be possible reactive coping responses (e.g., staying away from home or other sources of support, using drugs, dropping out of school, or becoming committed to negative peer models).

As youth employ various reactive coping strategies consistently over time and place, self-appraisal continues, and those strategies yielding desirable results (i.e., objectively viewed as either positive or negative) are repeated. For example, negative peer approval might still feel comfortable and psychologically safe than the work involved in creating more adaptive solutions, which might require a change in peer relationships. The consistency of the reactive coping pattern has important implications for psychosocial processes. As suggested in Figure 15.12, the reactive coping strategies become stable coping responses, and, over time, yield *Emergent Identities (4).* Thus, the fourth component of PVEST defines how individuals view themselves in and between their various contexts of development (e.g., family, school, peer group, and neighborhood). The combination of factors such as cultural/ethnic background, understandings about gender roles, and self and peer appraisal all define our identity. As new challenges are met, the stable method of responding has implications for decision-making processes, options elected, and, given individual-environment transactional influences and the role of stereotyping and stigma, objective optional choices available.

As reviewed in great detail elsewhere (e.g., Spencer & Markstrom-Adams, 1990; Swanson et al., 1998), identity processes provide behavioral stability over time and place and lay the foundation for future perceptions, self appraisals, and behavior such as decision-making processes. Given the sets of stage-specific developmental tasks outlined by Havighurst (1953), the resulting and ongoing problem-solving and decision-making behavior can yield adverse or productive *Life-stage Specific Coping Outcomes (5).* Figure 15.12 describes the fifth component and indicates that productive outcomes might include school engagement, positive family relationships, adequate employment preparation, staying out of jail, and low levels of high risk behavior. Alternatively, adverse outcomes can include school dropout, poor school performance, illegal means of earning income, poor health, incarceration, and teenage or out-of-wedlock child bearing.

The dynamic and ongoing recursive process of negotiating risks while identifying and garnering protective factors for decreasing vulnerability continues between, within, and throughout each life stage. More specifically, this recursive process occurs as individuals encounter new stressors (i.e., through balancing challenges with supports), establish more expansive repertoires for reacting to coping needs (i.e., given the availability of both maladaptive and adaptive coping "opportunities"), and redefine how individuals view themselves, which also *impacts how others view them.* As noted by Erikson (1968), unresolved issues in one life stage influence future coping and identity-formation processes. Accordingly, PVEST aims not only to capture this developmental process but also to place it in broader social contexts. As illustrated in Figure 15.13, one could use the framework for testing any set of orienting issues as an entire system or as easily pursue its use for examining variable relationships both within and between only two or three components (e.g., Net Vulnerability and Net Stress Experienced). As suggested by the illustration, one could explore parent- or policy-level variables for Components 1 through 4 with an examination of youth outcomes as Component 5. Indeed, Figure 15.13 illustrates several of the numerous constructs

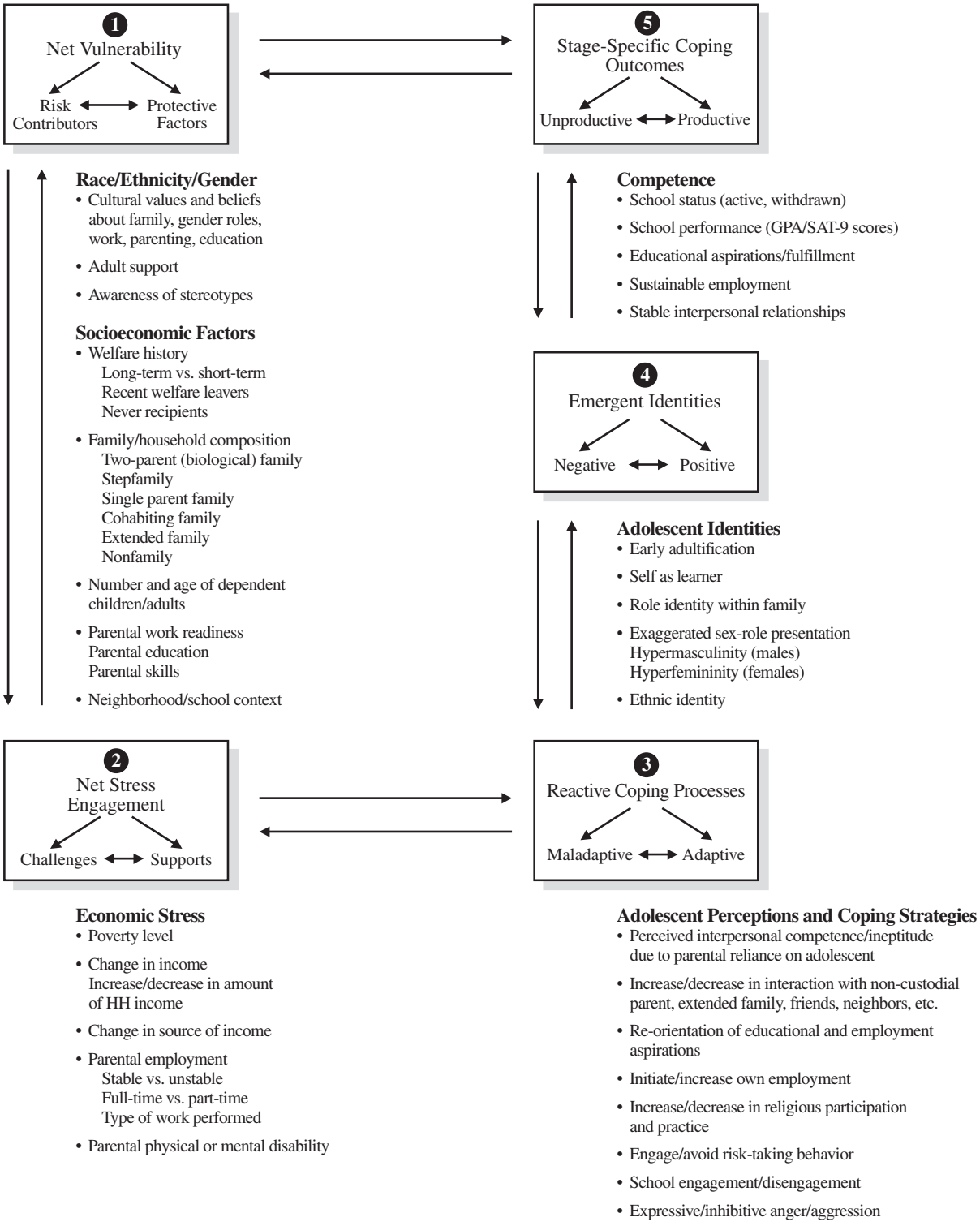


Figure 15.13 Demonstration of Phenomenological Variant of Ecological Systems Theory (PVEST) application: Using framework for analyzing the effects of specific economic policies and requirements for parents on adolescent academic and employment outcomes.

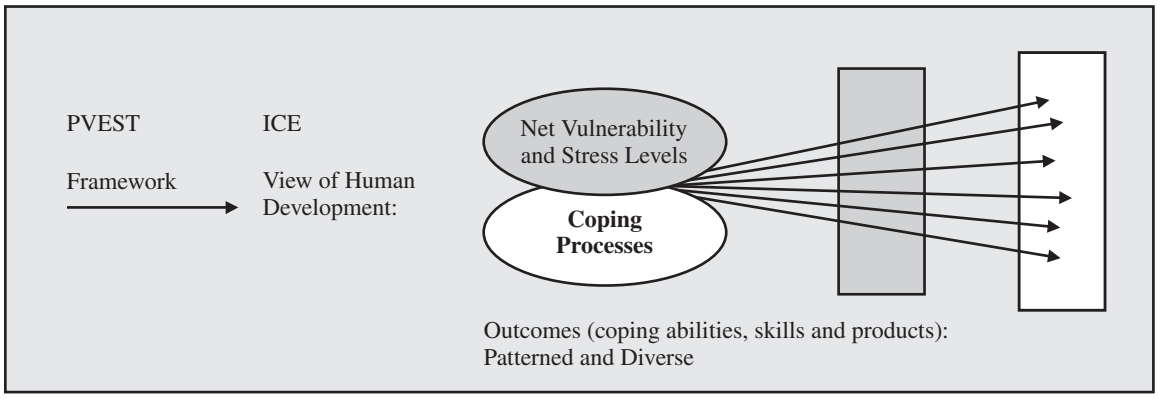
possible for examination in considering each of the five components of the framework.

The illustrative possibilities would vary as a function of the populations of concern and specific developmental period of interest. Further, it is necessary to appreciate the unique role gender plays because, for instance, when studying outcomes among boys, the illustrative constructs represent unique experiences that are distinctive to boys across the components. As suggested by the introduction to the framework and illustrated in Figure 15.14, PVEST is a synthesis of many contributing perspectives and provides an ICE perspective of human development.

In examining the relationship between net vulnerability and net stress, PVEST explores the combined impact on coping processes specific to particular developmental stages. Given the contributions from multiple theoretical perspectives, it aids our explanations and interpretive analyses of both similar and different outcomes. As illustrated in Figure 15.15, the outcomes of these interactions and processes occur in nested ecologies that vary significantly in character as a consequence of particular social constructions and individual characteristics, histories, and experiences.

Most important, as illustrated in Figure 15.16, coping outcomes may differ both between groups and within groups (e.g., including ethnicities, races, and families). There are numerous differences in meaning-making processes expected for youth sharing the same race, household, or classroom.

Our approach is quite different from those that anticipate homogenous group outcomes that are generally assumed to represent either deficits or inferred privilege. PVEST provides a systems framework for understanding all possible variability. More important, given the impact of the context on individual or group attitudes and beliefs, the pattern of coping outcomes has the potential of contributing to the level of vulnerability. Figure 15.17 on page 854 illustrates the feedback loop created as a function of societal stereotype dependence thus demonstrating the recursive relationship between the unique



Theoretical and Conceptual Formulations:

- Eriksonian theorizing about ego identity processes
- Du Bois' notion of double consciousness
- Symbolic interactionists theorizing about phenomenological processes (e.g., Sullivan & Mead)
- Competence and socialization perspectives (e.g., Robert White & Brewster Smith)
- Resiliency and vulnerability (e.g., J. Anthony)
- Cross' Reference Group Orientation (RGO) framework
- Chestang's views of character development and context quality
- Critical Race Theory (Crenshaw and others)
- Spencer's notions about the social cognition/culture cognition interface
- Ecological psychology and Bronfenbrenner's views about context
- Boykins' notions about a "triple quandary"
- Normal human development life-course theorizing (e.g. Brim's notions about continuity and change)
- Historical perspectives (e.g., V.P. Franklin, John Hope Franklin, & Glen Elder; Brown vs. Board of Educ.)
- White Privilege (McIntosh)

Figure 15.14 Acknowledging exemplar conceptual contributors to Phenomenological Variant of Ecological Systems Theory (PVEST) .

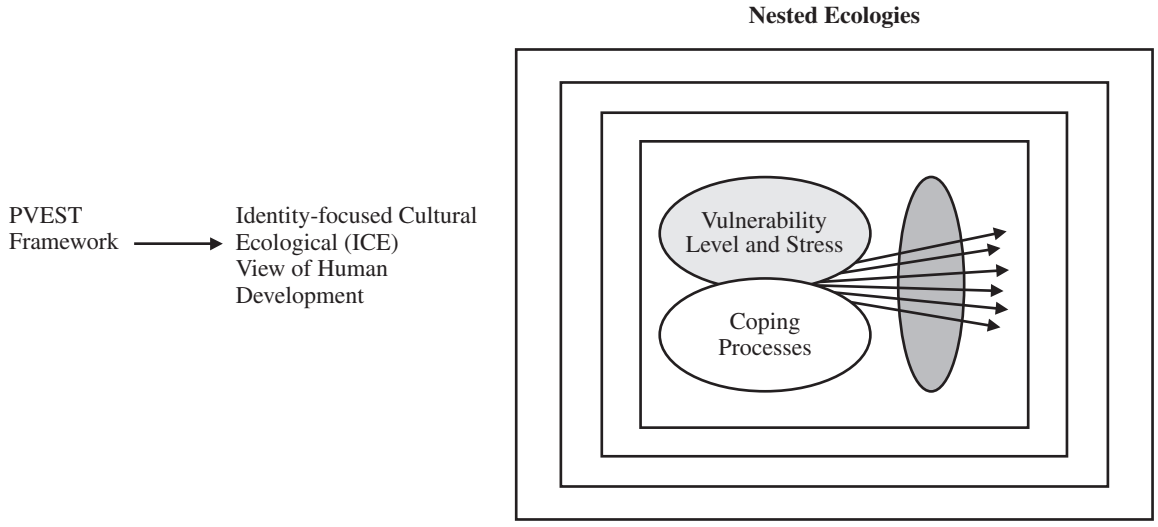


Figure 15.15 Advantages of framework: Phenomenological Variant of Ecological Systems Theory (PVEST) enhances interpretations of vulnerability with coping processes as linked with diverse sets of life course outcomes specified for particular developmental periods.

and patterned outcomes produced and their subsequent impact on net vulnerability, net stress experienced, mediating coping processes, and produced coping outcomes.

The modeled recursive feedback loop aids the explanation suggested by Claude Steele concerning achievement performance as linked to social stigma. Steele's perspective (2004) indicates that anyone is privy to *identity insecurity,* and social contingencies (i.e., the priming of social perceptions) have implications for performance. Parallel with our own interpretation, his views have important implications for the character of interventions needed to impact youths' academic performance. All of the bidirectional relationships between components of the framework suggest critical cross-cutting themes of importance in the design and support of prevention and intervention strategies.

CROSS-CUTTING HUMAN DEVELOPMENT THEMES OF PHENOMENOLOGICAL VARIANT OF ECOLOGICAL SYSTEMS THEORY: SALIENT FOR THE DESIGN OF INTERVENTIONS AND THE INTERPRETATION OF COPING OUTCOMES

It is not only symbolically important but also critical to conceptualize the unfolding of lives in cultural context. However, for groups such as urban youth of color, this is

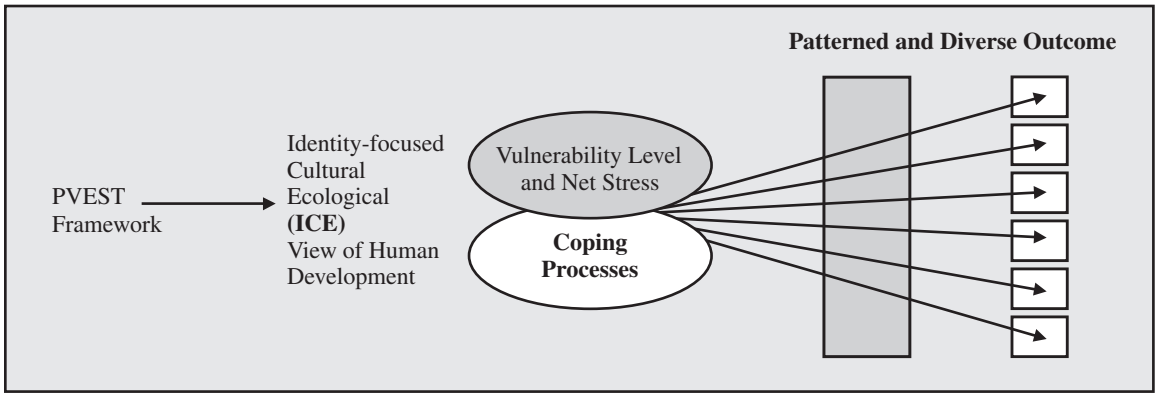


Figure 15.16 Predicting diversity: Phenomenological Variant of Ecological Systems Theory (PVEST) demonstrating the probability of both unique and patterned outcomes.

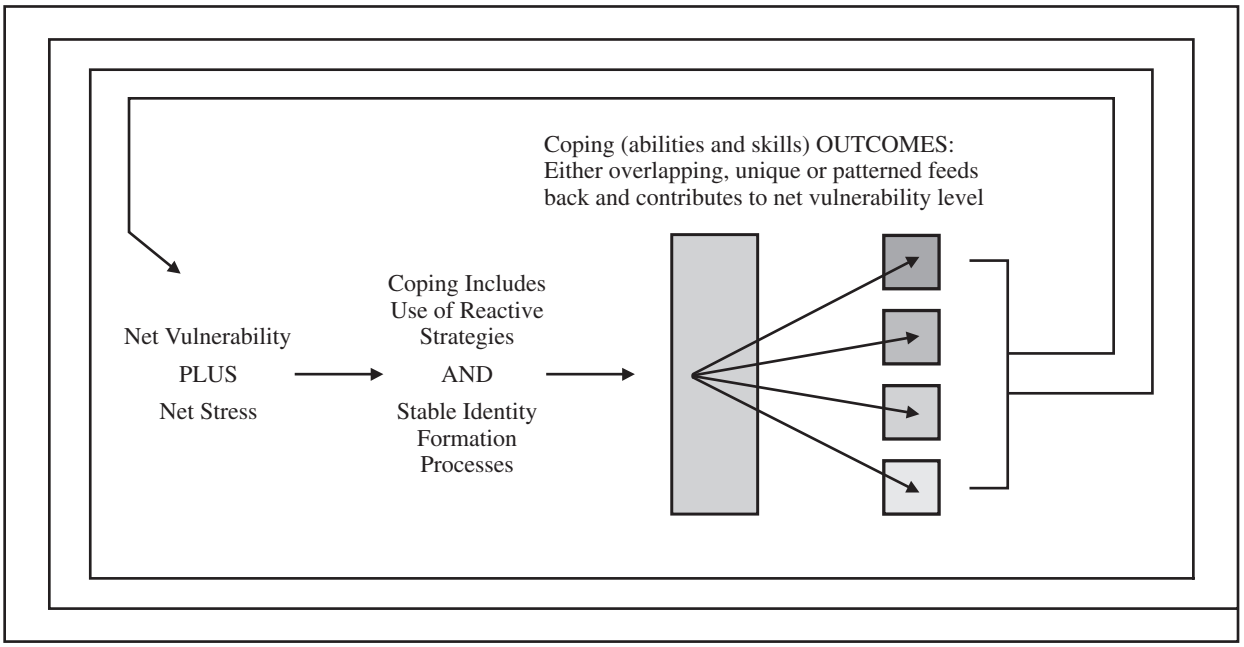


Figure 15.17 Phenomenological Variant of Ecological Systems Theory (PVEST) analyses afford an integration of individual coping with context character: As an ICE perspective the framework suggests exacerbating influences (through an acknowledgment of nested ecologies) that impact coping outcomes (i.e., either productive or adverse) given the experiences of net vulnerability and stress level associated with coping processes (i.e., manifested as coping strategies and identity formation efforts).

not frequently the conceptual strategy employed as illustrated by the ways in which we formulate questions, identify constructs, theorize about phenomena, interpret results, conceptualize, and implement social policy. There are few places in which this phenomenon—the study of lives in context—is less apparent than in the study of human development of marginalized youth in *urban contexts*. Further, when considered over time, there are few developmental periods for which this shortsightedness has had more dire consequences than in the formulation of research, theory, practice, and policy of relevance for middle childhood youth and adolescents.

Importance of Broad Cultural Inclusiveness and Context

A succinct tracing of the history of psychological science and the alternative advent of cultural-historical psychology helps in highlighting the importance of emphasizing and integrating the meaning and experience of culture in the consideration of human development. Although generally not acknowledged as a social construction, it is important to describe and explore the exacerbating influence of urban character on our thinking about culture, the conduct of psychological science, the character of educational praxis, and life-course human development experience. Considered from a PVEST perspective, all have implications for the unique challenges experienced by specific communities for some, and the occurrence of privilege and significant but unacknowledged support for others.

Meaning and Experience of Culture in the Consideration of Lives in Context

Developmental psychology came to life as a field of research virtually 100 years ago at the turn of the 20th century (S. H. White, 1996). Sheldon White notes that the field's birth followed an increase of nineteenth century writings about children. He reports that their lives and circumstances were examined philosophically, pedagogically, medically, politically, autobiographically, statistically, didactically, sentimentally, and apocalyptically: There was a commitment to the scientific study of child development. He goes on to report that, in the beginning, the approach stood insecurely on scattered facts strung together with much theorizing. Followers of Darwin put together observations of children, animals, cross-cultural beliefs and practices, psychopathology, and so on to sketch out an evolutionary picture of the human mind. It was risky, speculative science. Sheldon White reports

that Williams James, in the *Principles of Psychology,* called it "wild work" (S. H. White, 1996, p. x).

S. H. White describes the late nineteenth and early twentieth centuries as periods with organized cooperative research enterprises that were modeled on the natural sciences and describes the emulation as a fledgling discipline that yearned for status as a real science. S. H. White described it as "physics envy" because the physical sciences were well-formed and producing findings that were intellectually interesting and practically useful (S. H. White, p. xi). S. H. White's description allows the inference of a current and historically similar situation. There was a reasonable explanation for psychologists to imitate the particular pattern of cooperative activity; it provided the model for determining how far the approach would take it as a new science. By focusing on naturalistic questions and methods, psychologists sidestepped some tricky and risky concerns (S. H. White, 1996, p. xi).

S. H. White's analysis recognizes that the new psychology was also saddled with unique and awkward restrictions. The program of methods of the naturalistic scientific effort revealed particular patterns of organization of human perception, learning, and development, and the rhetoric of that research program asserted that such patterns must be true for everyone everywhere (S. H. White, 1996, p. xi). Most important, S. H. White (1996) champions Michael Cole's point of entry into the problems of twentieth-century psychological science as a reminder that aspects of the early assertion of universality were not true. He references Michael Cole's work with the Kpelle in Africa in the 1960s that led to a salient observation:

> Although tribal children classify, learn, remember, form concepts, and reason in everyday life, they do not perform in a sophisticated manner on experimental procedures designed for the study of age changes in those faculties. Western research procedures are grounded in a world in which children go to school at 6 years of age and are surrounded by the life, language, and thought of a modern society. Much of what we consider to be normal to child development is simply a recognition of what usually happens when children grow up in such a world. (S. H. White, 1996, p. xii)

S. H. White's point was that Cole's work along with other cultural psychologists suggested significant difficulties in the use of traditional natural-scientific inquiries to compare people across cultures. An analogous point may be made when considering the conjectures drawn from urban research contexts because a broadly made assumption is that proximity suggests similar experiences, which represents yet another fallacy. S.H. White also notes that:

> The fact that some twentieth-century psychology has produced findings that are only true within situational boundaries is not completely surprising. Before this century, a number of distinguished philosophers argued that in order to fully understand how the human mind works we will require two psychologies of different orders. We will need the kind of naturalistic psychology with which we are familiar, analyzing mental phenomena as constructions built out of sensations, ideas, associations, reflexes, or sensorimotor schemes. We will need also a less-familiar "second psychology" describing higher-level mental phenomena as entities given form by the language, myths, and social practices in which the individual lives. Such a second psychology would not be expected to yield universal findings. Since higher mental processes are formed by culture, they differ from society to another. (1996, p. xii)

In addition to Cole, S. H. White posits there has always been a lineage of *cultural psychologists* who have argued for:

> An emphasis on *mediated action in a context*; the use of the "genetic method" understood broadly to include historical, ontogenetic, and micro-genetic levels of analysis; the grounding of analysis in everyday life events; the assumption that mind emerges in the joint activity of people and is in an important sense, "co-constructed"; the assumption that individuals are active agents in their own development; rejection of cause-effect, stimulus-response, explanatory science in favor of a science that emphasizes the emergent nature of mind in activity and that acknowledges a central role for interpretation in its explanatory framework; methodologies that draw upon the humanities as well as the social and biological sciences. (1996, p. xii)

Sheldon White describes efforts expended for this second psychology that began in the 1920s with work by Vygotsky who suggested the need for a human science of psychology that could stand beside the existing natural science of the time. He argued that the need to "understand" human mental life was deeply connected to the manufactured objects in our world. Human beings live in a world of human artifacts—tools, words, routines, and rituals—changeling objects that are at once and the same time things the individual must deal with and repositories of prior human thought and judgment (1996, xiii). As reported by S. H. White, the integration and consideration of *culture,* for Michael Cole (as a cultural-historical psychology) means understanding

that psychology comes to life *only* when there are research procedures through which people can experience and know the world together. As noted by S. H. White, Vygotsky asserts a critical philosophical position of importance in this regard. "An artifact is an aspect of the material world that has been modified over by the history of its incorporation in goal-directed human action. By virtue of the changes wrought in the process of their creation and use, artifacts are simultaneously ideal (conceptual) and material" (p. xiv; emphases added). S. H. White is quite clear that "artifacts" are the fundamental constituents of culture. The growth of the human mind, in ontogeny and human history, must properly be understood as a co-evolution of human activities and artifacts. The words we speak, the social institutions in which we participate, the man-made physical objects we use, all serve as both tools and symbols. They exist in the world around us; they organize our attention and action in that world and, in the aggregate, they create "alternative worlds" (p. xiv). It would appear that including the individual's own reporting (i.e., as phenomenology) of the particulars of "alternative worlds" would be critical for arriving at an understanding of specific meaning-making processes by individuals as they mature over time, transition across multiple settings and physical spaces, and cope with the attendant contextual demands.

Accordingly, there are few places where this phenomenon is as evident as in the coping processes of youth growing up in *socially constructed urban contexts.* There are few examples more poignant than the unique and co-existing struggles of diverse urban youth and families in their efforts to demonstrate resiliency in socially constructed although infrequently acknowledged urban cultural contexts. S. H. White (1996) suggests that a "cultural-historical approach to the study of mind dictates that when we study human development we must make the study of surrounding social practices part and parcel of our inquiry." And relative to policy and programming issues, "Similarly, if we want to change the pattern of a human being's activities, we need to address the surrounding situations in which those activities live" (p. xiv).

As scholars and researchers interested in human development from a global perspective, there are few context-concerns of more importance than the need to examine the assumptions and questions that guide the conduct of the research industry and policy enterprise. A clear demonstration of this dilemma is the experience of immigrant youth (see Spencer, Harpalani, Cassidy, et al., 2006). As an illustrative case, the cultural context of African American *male youths* is described before moving to the unique experiences of immigrants.

The Cultural Context of African American Males

S. H. White's "alternative worlds" perspective is particularly evident in the coping processes of African American boys growing up in socially constructed urban contexts, particularly in public schools in low-resourced and unusually stigmatized social systems. Boykin (1986) suggests that the behaviors and practices evident in contemporary communities where African American boys develop have their genesis in African cultures. These behaviors and practices manifest themselves differently, depending on the social, physical, historical, and economic contexts in which the boys interact. Although this assertion has multiple political implications, it also offers insight into the dynamic nature of culture. Simply by their contrast to mainstream culture, the behaviors and practices that characterize African American communities are assumed not to be cultural but, instead, deviant (Jarrett, 1994; Oyemade, 1985). Kottak (1987) notes that culture is learned and cultural learning is dependent on "the uniquely human capacity to use symbols, signs that have no necessary or natural connection to what they stand for. . . . A person born anywhere begins immediately through a process of conscious and unconscious learning and interaction with others, to internalize, or incorporate, a cultural tradition through the process of enculturation" (p. 23). As Kottak implies, a great deal of culture is expressed in the human ability to give meaning and value to a thing, activity, or event. The next section places emphasis on understanding the meanings that is given to experiences that appear to be unique to African American children and families. Particularly illustrative to this point are the findings of race awareness and racial attitudes studies.

From a set of programmatic studies of race awareness, racial attitudes, and self-esteem findings from the early childhood years to adolescence, Spencer and colleagues have obtained quite interesting findings for Black boys. Beginning in the preschool stage (e.g., Spencer, 1970; Spencer & Horowitz, 1973), findings suggest that Black boys learn the cultural symbols for group membership at the same rate as girls. There are no gender differences in preschoolers' Eurocentric (i.e., White valuing and Black devaluing) evaluative judgments of things dark in hue and of pictures depicting African American people: Three-year-olds learn the symbols as effectively as 5-year-olds (see Spencer,

1970, 1999b; Spencer & Horowitz, 1973). As indicated by Spencer (2005), those cultural symbols and meanings for "self processes" become increasingly more complex for Black males by adolescence.

The Unique Experiences of African American Male Adolescents

As reviewed by Spencer (1999a), for African American boys who are generally viewed with some degree of dissonance and trepidation by the larger society (see Cunningham, 1993), the task of managing an ego-supporting identity while coping with generalized negative imagery is daunting. The dilemma may be parallel to male adolescents generally, however, African American males specifically are expected to shoulder the traditional negative stereotypes associated with male adolescence, along with the added burden of enhanced, often unacknowledged negative imagery linked with minority status. Often overlooked, negative stereotypes influence character and reactions to socialization efforts such as those extended both in and out of school. That these conditions and experiences are not formally recognized (although are part of youths' daily experiences) make the individual's management of normative developmental tasks more challenging. Specifically, those tasks associated with establishing a moral identity or academic (achievement-linked) identity are particularly salient when coupled with attendant outcomes potentially more diverse and open to *mis*interpretation. Accordingly, African American male adolescents, in their efforts to cope with normative developmental tasks with few resources and supports, may deploy coping methods that prove to be less than constructive. The responsive methods deployed by African American youths (i.e., what we generally term as *coping methods*) may be emotionally comfortable for a short period. These strategies are also used by privileged youth in their pursuits of autonomy; however, given stereotyping they frequently further exacerbate an already challenging situation in the end when deployed by African American male youth.

The struggles associated with autonomy linked developmental tasks are quite challenging. Theorists suggest that growth in value autonomy is linked to expected cognitive changes. We suggest that these changes, although infrequently considered for African American youths, particularly males, require a sensitive and simultaneous synthesis of context character. Necessary for consideration in this synthesis includes both the process and product of individuals' evolving understanding of the world as youth struggle with inequitable conditions, normative stage-specific processes, growth in value autonomy, and expectations for positive outcomes in response to normative developmental tasks. Irrespective of societal status, youthful performance expectations are generic across groups and an equivalent level of competence and resiliency is anticipated for all peers *independent of degree of special challenges experienced by specific groups.* For the most part, both entitlements and extra challenges are ignored, although similar stage-specific positive outcomes of competence, physical and psychological health status, and broad achievements are expected for all. Generally lacking in our thinking, however, as we consider achievement-linked outcomes such as the achievement gap between Black and White academic performance, is *an appreciation of youths' interpretive framework and perceptions concerning (a) context risk and presence of protective factors, (b) attendant stress and accessible supports, (c) available coping methods for reactive deployment (used for guaranteeing psychological health and physical survival), and (d) models of stable coping processes (identities) and patterned coping outcomes (e.g., including both achievement-relevant and moral identity-linked).* An awareness of youths meaning-making including assessments of resources and challenges have implications for *how they traverse* patterned and unique psychological and physical challenges. There are also intriguing interactions between factors.

The dilemma of competing allegiances (triple quandary; see Boykin, 1986) and competing socialization contexts (see Allen, 1985; Boykin & Ellison, 1995; Boykin & Toms, 1985; Brookins, 1985, 1988; Hare & Castenell, 1985; Johnson, 1988) is rarely perceived as being more evident than in the experiences of African American males. The growth of value autonomy may be dramatically illustrated by urban youths' pursuit and acquisition of respect. For many boys growing up in low-resource communities, the demand and demonstration of independence and responsibility occur early (see Holliday, 1985a, 1985b). The value and recognition of both of these character qualities are evident in microsystems such as family, community, and church. The recognition and the early assignment of characteristics of maleness to African American boys is interesting. Generally reported anecdotally, there is a penchant to refer to a male baby or toddler as "little man." The motivation for the term's frequent usage is linked to an expressed and global valuing of maleness and may not represent a conscious effort to "adultify" male children. Instead, the widespread use of the term, particularly by

African American men, suggests an effort to short-circuit the use of the slavery-associated penchant of Whites to refuse adulthood status to Black men by referring to them as boys. Thus, from an African American adult male's perspective, a father's use of "little man" to his son may be solely one of endearment. The particular language used connotes pride in his son and expectations for a future manly role.

The purpose of such language is its attempt to neutralize the prevalent use of Black male stereotyping and undervaluing of Black males by the broader society. Young children, however, are developmentally egocentric (appropriately self-centered) and remain so until about 6 or 7 years of age (see Spencer, 1976, 1982). Therefore, taking the perspective of another can depend on a combination of cognitive maturation and social experience. As a consequence, children hear, use, and understand language and interpret its content from their own (appropriately) limited cognitive perspective. Accordingly, in the case of African American men and boys, use of "little man" language may unavoidably result in children's inferring a set of expectations to behave and take on the responsibilities of manhood while still a youngster. From a PVEST perspective, specific socialization strategies, expressed as reactive coping methods, that are deployed by parents and intended to short circuit the internalization of prevalent stereotypes, may themselves introduce errant self perceptions. Cultural socialization is in addition to the other traditional socialization tasks for which all parents are responsible; thus, the additional need of contemporary Black adults to responsively cope with historical conditions (e.g., the verbal strategy used by slave owners to render adult African American men to child status) ultimately makes child-rearing responsibilities particularly onerous for African American parents (see Spencer, 1983, 1990).

African American male adolescents' pursuit of and sensitivity to obtaining respect from others (e.g., teachers, police officers, unknown citizens) can be problematic (see Spencer, 1999a). Teachers uniformly expect student-like behavior from children irrespective of the problematic and frequently unacknowledged affective school climate experienced by many African American and Hispanic children. Given particular cultural traditions, gender appears to be an exacerbating factor for *diverse* youth, particularly males. Without carefully internalized reactive coping strategies obtained from persistent cultural socialization efforts by parents, the dissonance created for African American males given social stigma is experienced as an early social challenge. As a basic ego need, youths' pursuit of respect may take on greater importance than the highly shared and valued acquisition of academic achievement (Spencer, 1999a). Irvine (1988) observes teacher-student tensions beginning in the early grades for boys. Accordingly, in the absence of close parental monitoring, if generalized respect from the broader society and the school are not forthcoming, adolescent males' reactive (or less constructive) coping response may be problematic; specifically, the taking on of "habitual right actions," which are polar opposite to those generally valued by society and expected by schools, may potentially have adverse academic performance implications (see Cunningham, Swanson, Spencer, & Dupree, 2003). The awareness of inequities and need for respect may complicate family dynamics particularly when accompanied by biological-based normative challenges such as off-timed maturational rate differences (Swanson, Cunningham, & Spencer, 2003).

Gender-intensified behavior, such as hypermasculinity, may be seen by youth as potentially more effective in generating respect than the instrumentality- and future-linked outcomes associated with academic achievement. Another exacerbating but normative factor is the relatively late acquisition of a time-perspective (a true sense of the future), which is linked to the present and past as a cognitive construction and acquisition, and is usually reserved until mid- or late-adolescence. Before then, young people require significant aid in understanding and implementing the links between current behavioral investments (e.g., studying and school engagement) and long-terms valued outcomes (e.g., secondary school graduation and successful career preparation). Given the normatively late acquisition of a time concept, it is not surprising that many male youth do not understand that the 12 years of primary and secondary school preparation and academic engagement provide a critically important opportunity; this is another reason why *parental monitoring* is closely linked to academic outcomes for youth generally, and, given the problem of stereotype threat described by Claude Steele and colleagues, this appears particularly salient for African American youth (see Spencer et al., 1996; Spencer & Swanson, 2000). As a long-standing value espoused by African Americans, documented both before and after slavery (Spencer, Cross, Harpalani, & Goss, 2003), and integrated as a cultural value shared through parental socialization efforts, education contin-

ues to be highly valued by the African American community (Spencer, 1983, 1990). Educational success increases (not guarantees) the probability of acquiring the long-term respect that hypermasculine reactive coping behavior connotes and that Black boys and adolescents desperately seek and need (Swanson, Cunningham, & Spencer, 2003). However, the variety of historical, structural, and contemporary barriers and challenges make the educational process inopportune for some youth. Similarly, the normative experiences of immigrants to the United States appear no less complex and, from a PVEST perspective, suggest different sources of risk that may contribute to youths' vulnerability level. An inclusive and broad understanding of risks for diverse groups promotes an improved articulation of basic supports required and culturally specific interventions necessitated for obtaining competence for youth generally. A PVEST approach provides a culturally sensitive mechanism for linking unique risks and protective factors with context features experienced by specific groups—the individual-context analysis, given evolving perceptual developments aids, determining the level of vulnerability anticipated and the kinds of supports required for obtaining the best possible outcomes.

Special Experiences of Immigrants

Given the cautions described by S. H. White (1996) concerning the need for a cultural-historical approach, this section explores various risk and protective factors that second-generation immigrants from collectivist societies may experience living in the United States. Focusing particularly on the experiences of Asian Americans, specifically South Asian Americans, we emphasize that the problems and concerns addressed here are certainly not indicative of all South Asian Americans. Consistent with Cole's (1996) cultural psychology perspective and S. H. White's (1996) critique, we believe that an individual constructs his or her own worldview in his or her own way. However, the construction is unavoidably linked to context character (Lee et al., 2003). As discussed elsewhere (Spencer, Harpalani, Cassidy, et al., 2006), using the phrase "South Asian Americans" or "second-generation South Asian children," we actually refer to individuals who are specifically born and raised in the United States and who have immigrant parents from the following countries in South Asia: India, Pakistan, Sri Lanka, and Bangladesh. As illustrated previously in Figure 15.12, PVEST provides a helpful framework for exploring the development of identity in South Asian Americans. Relative to the first component, Net Vulnerability (the balance between risks and protective factors), the particular risks to South Asian Americans become salient when discussing the differences between what constitutes individualistic societies, such as the United States, and collectivist cultures such as those of South Asian countries.

Individualistic societies follow an ideology that revolves around personal autonomy, independence, and self-reliance. These societies aim to create individuals who are able to separate themselves from others and from situational contexts. The independent self is constructed to be a fixed entity that does not change when social situations change. "The independent self-system thus seeks to display or assert attributes or features of the self. The others in a social situation are important, but they are important primarily as standards of social comparison or for feedback that can validate the inner attributes of the self" (Markus & Kitayama, 1991, p. 22).

Collectivist societies strive to emphasize obedience and conformity. Their primary goal is to shape individuals into interdependent beings who are defined by their relationships. The interdependent self is seen as being fluid (able to change when the social environment around them changes), dynamic, and defined by roles according to situation and context. "Such an interdependent self is not properly characterized as a bounded whole, because it changes structure with the nature of the particular social context" (Markus & Kitayama, 1991, p. 23).

Given the drastic differences inherent in these two types of societies, it is highly probable that immigrants from collectivist societies who move to the United States may experience many difficulties adjusting to their new surroundings. When individuals choose to immigrate, they may come with practical knowledge of the country to which they are moving. However many will not be adequately versed in the cultural and societal values, beliefs, attitudes, and so on of the foreign country they are adopting as their new home. This circumstance may produce significant problems for some immigrants, especially for those who may have difficulties in acculturation. Even though these immigrants may be aware that they are going through intense emotional and mental changes, they may be reluctant to seek help from outsiders, including mental health professionals. This reluctance may be attributable to suspicion, doubt, fear, uncertainty, confusion, shame, or ignorance of Western psychology and psychologists. This analysis and decision to refrain from accessing objective support may be acceptable for the immigrants themselves,

but what about their children? The acculturation process can be daunting for immigrants who may have already developed a strong sense of identity and self while living in their mother country. However, the processes of acculturation and identity development are heightened in intensity for second-generation immigrant children living in the United States (Spencer, Harpalani, Cassidy, et al., 2006).

Theorizing by Mehta (1998) addresses these processes in the South Asian Indian American population and suggests that "the second generation has been exposed to distinctly different language, goals, food, rituals, dress, music, landscapes, and values than their parents. There is a strong urge to retain ethnic identity while rapidly acquiring awareness of American values, partially due to financial gains" (p. 133). Because of this disparity between their ethnic identity and their national identity, South Asian American children are faced with what many have coined a clash of cultures: the collectivist ideologies from their families constantly coming into conflict with individualistic ideologies from the surrounding environment. Second-generation South Asian Americans must grapple with the exceedingly difficult task of juggling opposing philosophies successfully to survive. From a PVEST perspective, it is safe to say that protective factors in one cultural setting may not serve as an effective source of support when acculturating to a new cultural niche.

The tension from a clash of cultures that many South Asian Americans experience is a significant risk contributor that increases vulnerability and net stress and has implications for identity development (Spencer et al., 2006). Similar to identifiable diverse youth, South Asian youths' physical features serve as a risk contributor because being easily identified can lead others to perceive them as foreign, even though they have been born and raised in the United States and are U.S. citizens. This dichotomy between the physical and internal selves may have implications for disruptions in self-image and self-esteem, which may interfere with competence strivings and mental health. Interestingly, given available protective factors, social supports, and models of adaptive coping methods, many youth still maintain a healthy sense of self and demonstrate resiliency.

Similar to many families of color, a protective factor, which also functions as a potential source of support in the PVEST framework, is the South Asian immigrant family unit. To understand the relevance of the self in relation to the family, which may function as a risk contributor, it is important to discuss the concept of in-groups and out-groups in a collectivist cultural context. An *in-group* constitutes an individual's immediate social environment. In South Asian countries, this may include the family (both nuclear and extended), friends, coworkers, and peers (Markus & Kitayama, 1991). The individual is connected intimately with their particular in-group and therefore, according to Sethi, Lepper, and Ross (1999) "the self and relevant in-group members may become psychological entities prone to relatively similar inferential, judgmental, attributional, motivational, and perceptual biases" (p. 10). The collectivist self is thus defined according to his or her in-group. However, the process of immigration disrupts the concept of an in-group.

Especially relevant in the case of children, when individuals drastically change their social, societal, and cultural environments by moving to another country, extended family, friends, coworkers, and peers are left behind. These individuals must break the close bonds they shared with their established in-group in South Asia and leave the stability and security of their lives to seek fulfillment of their goals and aspirations in another country. For people who are interdependent, the experience of leaving their in-group can be very traumatic. The severing of ties may be exceedingly difficult, especially if a comparable kin network is not already established in the adopted country. From a PVEST perspective, to maximize supports for offsetting challenges, immigrants must learn to create their own kin networks with other immigrants in their new environment. Although the friendships formed may be comforting and provide emotional, psychological, and perhaps financial support they may not compare as favorably to those relationships between family members or lifelong friends that were established in their country of origin. Accordingly, the identification and acquisition of supports *may themselves introduce challenges* that interfere with the positive balance sought for overall net stress level.

The character and experience of an in-group may function differently in a foreign country. Triandis (1989) suggests that "collectivism is associated with child-rearing patterns that emphasize conformity, obedience, and reliability. Such patterns are usually associated with rewards for conformity to in-group goals, which leads to internalization of the in-group goals. Thus people do what is expected of them even if that is not enjoyable" (p. 513). However, characteristics that might suggest psychological protection in the country of origin might function differently in the adopted country. For example, the heavy emphasis on obedience and conformity, especially among individuals who are highly traditional and conser-

vative about upholding the customs of their culture may tend toward strict parenting. Accordingly, this poses a definite risk for South Asian American children living in an individualistic society that focuses on independence and autonomy (Spencer, Harpalani, Cassidy, et al., 2006).

The South Asian family's economic status also poses a risk and potential for experiencing a downside of privilege. Mehta suggests that "Given the fact that immigration from India has largely been restricted to the educated groups, this immigrant population in the United States, unlike other immigrant groups, has achieved remarkable economic prosperity" (Mehta, 1998, p. 132). Already, Asian Americans are viewed as the model minority in U.S. culture. The financial success of South Asian immigrants may invoke animosity in other racial and ethnic groups, which can lead to racial conflicts, leaving South Asian American children vulnerable to threats, harassment, and potential violence. Accordingly, from a PVEST perspective, protective factors generally available to offset more traditional risks may not necessarily serve that purpose if the context presents other risk factors associated with stigma, stereotypes, and associated stress.

Gender may be another important risk contributor that enhances vulnerability. Given the varying expectations and viewpoints in South Asian culture toward both sexes, we can expect that the processes underlying identity development have the potential to be drastically different for males and females. However, due to lack of extensive research available with regards to this racial group, it may be a better strategy to focus on South Asian Americans as a collective whole.

Spencer, Harpalani, Cassidy, et al. (2006) suggest that the theoretically close relationships assumed for collectivist cultures are expected to serve as protective factors that are transformed into sources of stress. However, two of the most problematic, controversial, and emotionally charged areas in a South Asian American's life are choice of career and romantic relationships because these are two of the most important decisions that directly affect youths' relationship with their parents. Mehta supports this assertion by including "sexual conflicts" and "career conflicts" in her five proposed areas of developmental conflicts (1998). However, more generally, the stressor can be any situation where immigrant parent expectations conflict with U.S. societal expectations.

Like other youth of color, South Asian American children must confront a complex social environment in the United States, including school, university, peer groups, and the media. The latter teaches them to be their own person, exert their autonomy and independence, and follow their own aspirations and desires. They see that there is more than one option available and are encouraged to choose what *they* feel is best for *themselves* (including what makes them happiest). However, South Asian American children are also expected to follow what their parents say and fulfill their obligations to their families. "The Anglo-American social and cultural values of self-sufficiency, autonomy, and personal responsibility are often misinterpreted by immigrant parents as selfish, and the parents place excessive restrictions on their children" (Mehta, 1998, p. 150).

Second-generation South Asian Americans therefore receive two completely different messages about construction of self. This dilemma poses a serious challenge for successful identity development. The South Asian family unit can serve as a significant and comforting source of support, especially given its probable closeness and intimate nature. Alternatively, given the diametrically opposed identity messages received by youth, families may also represent a significant source of stress. Family friends who are a part of the South Asian family's kin network and the South Asian American's peers from various social settings, including school and neighborhood, could also serve as potential supports. However, these supports can also become potential sources of pain and confusion, depending on how South Asian Americans choose to handle the decisions regarding choice of spouse and career.

In some South Asian families, it is possible for parents to accept and feel comfortable with their son's or daughter's choice to adapt and conform to their American surroundings. It is still highly unlikely that conflicts with these more open-minded immigrant parents will never occur because most South Asian American children describe being caught between the two cultures as living an "American life from 9 to 5 and an Indian life from 5 to 9. This duality represents a very important feeling of split identity in the second-generation immigrant from South Asia" (Mehta, 1998, p. 137). Ideally, these conflicts may be minor and not hinder the South Asian American's identity development, but it is not always the case.

In most instances, children will reach a crossroad at some point in their lives where they must choose one or the other. The question is which ideology do they follow, and how does this play out? Of importance is that PVEST elaborates the role of reactive coping strategies specifying salient implications for identity processes. It

may be this recursive stage between net reactive coping strategies and emergent identity processes that the South Asian American's self-perceptions prove to be most crucial. As described elsewhere, stable self-perceptions can determine whether one uses or downplays certain abilities, emphasizes or draws attention away from certain physical attributes, adopts or suppresses certain behaviors, and engages in or shies away from certain activities (Spencer, Hartmann, et al., 1997, p. 47).

If a South Asian American chooses to adapt to his or her environment by identifying fully as American and rebelling against their parents to participate in normal American cultural activities such as dating, going to the prom, or even choosing a career path that immigrant parents do not deem as acceptable, this action may be viewed as either adaptive or maladaptive and thus youths' weighing of consequences is critical. On the one hand, this coping strategy can definitely be seen as positive given the tremendous pressure from society to fit in with their peers. However, it can also be seen as negative, considering the tenacity of the bonds between family members, second-generation South Asian American children must face the severe trauma of shaming their family if they follow the motto of American culture: "Following one's own heart and pursuing one's own dreams." Additionally, depending on the amount of conservatism the family observes, South Asian American children run the risk of losing their families altogether because of exerting their independence. This sense of shame and loss of the family happens because, according to their South Asian parents' perspective, the action of South Asian American children making their own choices in life becomes translated into exhibiting complete disregard and disrespect for their elders and family as well as displaying outright disobedience.

However, if South Asian American children conform to what their families want for them in cases where they internally would like to choose another option, this may also have negative and positive adaptive implications. By obeying their parents, these children run the risk of facing a life of unhappiness because they did not follow their own dreams. South Asian Americans may immediately experience this as they begin to feel disconnected from their peers, particularly if they are not allowed to participate in activities and events that are paramount in American culture, such as going out with friends, dating, and so on. The relinquishment of personal desires is exceedingly problematic when considering major life-altering decisions, especially if subsequently South Asian American children regret having listened to their families and are trapped in jobs or marriages that they find unbearably dissatisfying and unpleasant. They may eventually feel that they wasted their lives on the dreams and expectations of their family and culture and come to resent both (Spencer, Harpalani, Cassidy, et al., 2006).

Phoebe Eng, in her book entitled *Warrior Lessons,* addresses this choice of many Asian American children: "When asked why we frequently forgo our own wants in order to fulfill our parents' expectations, many of us respond with reasons that incorporate notions of filial piety and reverence for our elders" (p. 25). With observations such as Eng's, we can see how collectivist thoughts learned from the family can influence South Asian American children. The power of "filial piety" can be overwhelming and perhaps even suffocating at times, especially considering these feelings can be complicated further with guilt. Eng comments, "'Filial piety' is often synonymous with payback—a [child's] guilt and obedience in exchange for a [parent's] undying but tacit support. Our guilt can come in many currencies" (p. 26). These currencies, Eng continues, include words from immigrant parents that point out the many sacrifices they may have made. The opportunity to grow up with privileges and luxuries that immigrant parents never had and worked hard to give becomes tainted with guilt, and this guilt can lead South Asian Americans to feel compelled or obligated to obey their parents.

It is important to note that immigrant parents should not be viewed as selfish or wrong. These views and attitudes toward children are embedded within South Asian culture and are normal for collectivist societies. However when South Asian immigrants are placed within an individualistic framework, they may not realize that the same rules and social norms that they held in their mother country cannot necessarily be applied to all situations. The amount of conservatism immigrant parents may observe can directly relate to whether or not they themselves have successfully acculturated and dealt with the immigration process.

South Asian Americans therefore choose to adapt in various ways, according to how they perceive they should. They could go through one extreme, rebelling against their parents and essentially their culture to identify completely as American, or through another by identifying completely with their ethnic culture and denying their national identity. A third possibility is for

South Asian Americans to choose neither. These three coping strategies can be maladaptive and lead to potential problems. A fourth possibility is that they may negotiate and balance both identities successfully, which is obviously the most positive and adaptive solution.

The next phase of the PVEST model involves emergent identities. If South Asian Americans choose to rebel, they may come to view themselves positively if they gain acceptance and support from their American peers or friends. Mehta (1998) coins this identity as the "Amerocentric identity" where they hold "strong American values and [have] little contact with their ethnic background" (p. 134). They are most likely to feel comfortable in U.S. society, but feel disconnected to their families. South Asian American children may also view themselves negatively, especially if they are labeled as bad by their parents, which translates to meaning that they are a failure or have brought shame to the family. In extremely strict South Asian households, South Asian Americans may eventually be disowned or cast away from their families. They essentially take on the identity of being the black sheep of their family.

If South Asian Americans conform to their family's expectations, they may develop a positive identity with relation to their parents. Their family and culture become primary sources of support, and they are viewed and come to view themselves as the good and obedient child. However, these children may confront isolation and possible humiliation or ridicule from their peers, especially if they focus entirely on studies and do not participate in social gatherings, activities, or events. Mehta (1998) refers to these individuals as having developed the "Ethnocentric identity" (p. 134).

When South Asian Americans choose neither, they develop the "Compromised identity" which Mehta claims is the most problematic. In this case, South Asian Americans cannot connect to either their surroundings or their family's culture and become lost or alienated. Interestingly, this identity may develop if the South Asian immigrant parents have not dealt with acculturation successfully and they feel confused or conflicted about their own identity development since they immigrated themselves (Mehta, 1998).

The "Bicultural identity," which results from successful negotiation of both national and ethnic identity, develops in those children whose parents are willing to be flexible and open-minded toward U.S. culture and have successfully adapted to the United States themselves. These children feel connected to both their South Asian heritage and to their national identity as American (Mehta, 1998).

This leads to the final component of the PVEST model, "life-stage specific outcomes or coping products" (Spencer, 1999a, p. 47). Depending on which emergent identity eventually develops, the South Asian American can experience positive outcomes such as healthy relationships with their family, friends, kin network, peers from school or the neighborhood, and so on. They may experience healthy identity formation. However they may also experience identity confusion, psychological problems, disownment, and development of psychological disorders, which can lead to depression, even suicide.

The plight of South Asian Americans is serious when considering possible maladaptive coping strategies that lead to negative emergent identities and unproductive outcomes. These problems must not be taken lightly or overlooked. More and more cases of psychological disturbance, psychopathology, and suicide in the South Asian immigrant community are surfacing. Although it is difficult to determine what the exact cause of these problems may be, it is safe to guess that conflicts with marriage, love relationships, academics, and career play pivotal roles in troubling and complicating the lives of South Asian Americans to a great extent.

Despite the negative stigma attached to mental health and psychological problems in the South Asian immigrant community, more research needs to be conducted to investigate these issues. Additionally, clinical psychologists must be cognizant of these problems when treating South Asian American clients. The issues brought up in this section underscore the fact that it is imperative for psychologists in the United States to be trained in ethnic minority concerns and to be sensitive to the needs of their clients. By understanding the cultural context in which immigrant children live, psychologists can help South Asian Americans develop healthy emergent identities that leave them with stable, positive coping products.

Consistent for marginalized youth generally, immigrants specifically, and for youth who enjoy the appearance of consonant individual-context experiences (i.e., although, as indicated, European Americans may be vulnerable to the downside of privilege), *context matters.* Integrated and implicated in multiple ways from a PVEST perspective and as applied uniquely to diverse youths' experiences, *positive outcomes more frequently occur when programming, socialization efforts, social*

practices, and broad policies are linked to context character. Multiple perspectives about ecological contexts are available, vary by emphasis, and provide unique contributions to understanding transactional individual-context interactions.

ECOLOGICAL PERSPECTIVES: EXPLORING THE BIOECOLOGICAL MODEL

As reviewed in several places (e.g., Spencer & Harpalani, 2004), Bronfenbrenner and Ceci (1994) present four distinguishing attributes of the bioecological model. First, they define measurable mechanisms, known as *proximal processes,* through which genetic influences are actualized into observable phenomena. Thus, the processes that mediate genetic and environmental influences on human development are a fundamental component of the model. Second, Bronfenbrenner and Ceci (1994) highlight the aforementioned variability of heritability, noting that the bioecological model stipulates system variation in heritability as a joint function of proximal processes and characteristics of the environment in which these processes take place (p. 570). With this second feature, the bioecological model provides heritability as a measure—which ironically is the same measure used in most behavioral genetic studies. In the model, heritability is interpreted as the proportion of variance attributable to actualized genetic potential (Bronfenbrenner & Ceci, 1993, 1994), as opposed simply to genetic influences. Bronfenbrenner and Ceci (1994) note that heritability matters; they view its most important contribution in social science as those instances when researchers focus on its variability. The variation in heritability allows a linkage between heritability and developmental functioning, with the proximal processes defined in the first feature serving as the conceptual bridge between the two. The third characteristic of the bioecological model is that it considers variation in heritability as it relates to particular developmental outcomes (see Figure 15.18).

The fourth feature is that the model simultaneously evaluates heritability and absolute level of developmental competence. Bronfenbrenner and Ceci (1994) postulate that improving the quality of proximal processes will lead both to higher levels of heritability and to elevated levels of developmental functioning. The reason for the latter is readily apparent: Heritability will increase because as proximal processes improve in quality for individuals in a given population, these individuals will maximize their genetic potentials, and observed differences in the population will be due to these differing genetic potentials.

Bronfenbrenner and Ceci (1994) derive three propositions from their bioecological model, which they use to formulate hypotheses. The first proposition delineates the person-environment interaction in human development, stating "human development takes place through processes of progressively more complex reciprocal interaction between an active, evolving biopsychological human organism and the persons, objects, and symbols in its immediate environment" (p. 572). Bronfenbrenner and Ceci (1994) note that this interaction must be consistent over time to effectively facilitate development. Consistent patterns of interaction are the proximal processes defined earlier. Examples of proximal processes include a child's interactions with parents and peers, development of competencies and problem-solving skills, and acquisition of knowledge.

The second proposition of the bioecological model states, "The form, power, content, and direction of the proximal processes effecting development vary systematically as a joint function of the characteristics of

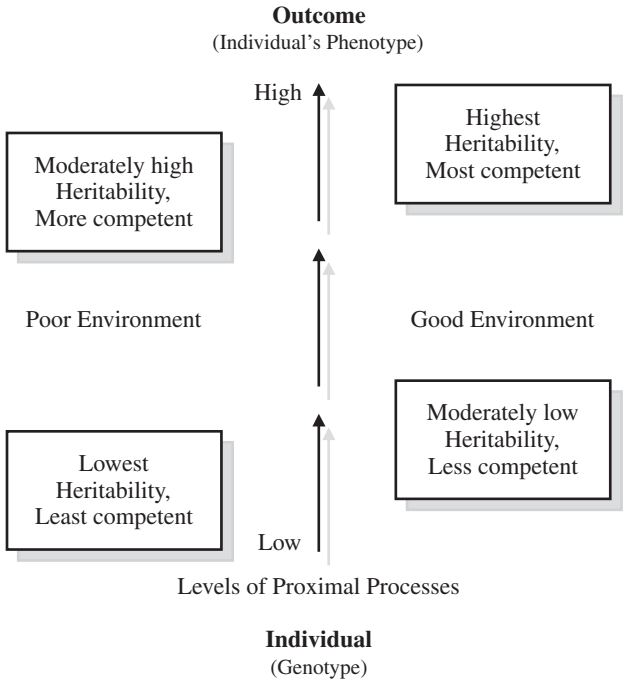


Figure 15.18 Bioecological model. Figure adapted from Bronfenbrenner and Ceci (1994). *Source:* From Spencer & Harpalani, 2004.

the developing person, of the environment—both immediate and more remote—in which the processes are taking place, and of the nature of the developmental outcomes under consideration" (Bronfenbrenner & Ceci, 1994, p. 572). With this precept, Bronfenbrenner and Ceci (1994) introduce the factors—attributes of the person and the environment, and the character of developmental outcomes being analyzed—that govern proximal processes and their impact.

With the third proposition, Bronfenbrenner and Ceci (1994) restate that proximal processes transform genetic potentials into actualized outcomes (phenotypes) and note that the factors that govern proximal processes dictate their power to actualize genetic potentials. From these three propositions, Bronfenbrenner and Ceci (1994) derive three hypotheses. First, they restate the view that effective proximal processes will increase heritability by increasing the proportion of variation attributable to actualized genetic potential. Second, they propose that in actualizing genetic potentials, proximal processes work to both enhance competence and reduce dysfunction, increasing heritability in both cases. The implications that follow from this hypothesis are:

1. Proximal processes have more power to actualize genetic potentials for positive developmental outcomes in organized, advantaged environments than in inconsistent, disadvantaged environments.
2. Proximal processes have more power to buffer genetic potentials for negative developmental outcomes in inconsistent, disadvantaged environments than in organized, advantaged environments.

These first two hypotheses essentially state that heritability, defined in terms of variance attributable to actualized genetic potential, varies as a direct function of the quality of both proximal processes and the environment. Bronfenbrenner and Ceci's (1994) third hypothesis is that proximal processes have a greater ability to actualize genetic potentials for positive developmental outcomes for individuals living in more inconsistent and disadvantaged environments. Bronfenbrenner and Ceci (1994) cite a few studies that they interpret as supporting their first two hypotheses (Fischbein, 1980; Riksen-Walraven, 1978; Scarr-Salapatek, 1971), and they note the obvious implications for intervention of the third hypothesis, which is derived from the first two. However, the authors also note that the model still needs to be tested extensively.

Ecological Systems Theory

While the bioecological model lays out the relationship between genetic influences, heritability, and proximal processes as they take place in particular environments, ecological systems theory (Bronfenbrenner, 1979, 1989, 1993) focuses on characterizing levels of environmental influence in terms of dynamic, interactive, systems of person-environment relationships (Figure 15.19).

As suggested by Figure 15.19 and carefully reviewed by Spencer and Harpalani (2004), ecological systems theory is organized hierarchically, involving interactive systems of increasing complexity embedded in the framework of human development. Bronfenbrenner (1979, 1993) begins by transforming Lewin's (1935) formulation that behavior is a coupled function of the person and the environment. He substitutes development for behavior, stating that development is also a function of the person and the environment over time. Also noted is the temporal contingence of developmental function. Each successive developmental period is dependent on all previous periods of development.

Bronfenbrenner (1993) notes that through most of developmental psychology, theoretical constructs devised to describe the characteristics of the person have not considered issues of context; developmental qualities of individuals are conceived without reference to the environments in which they are occurring (see Figure 15.19). Examples of such qualities include standardized psychological measures such as personality and IQ tests. This type of analysis reflects the *personal attributes model* (Bronfenbrenner, 1989) and has a narrow focus on the individual, assuming that findings from standardized measures can be generalized without attention to context. Bronfenbrenner (1993) questions the assumptions of environment generalizability that underlie the personal attributes model; he does recognize that these standardized measures are useful, but he argues that research designs must simultaneously consider issues of social, cultural, and historical context and incorporate context-oriented measures.

Conversely, the *social address model* (Bronfenbrenner, 1989), which is the most common approach, considers only environmental factors, such as social class, family size, and other demographic variables. The specific characteristics of the environment, activities that occur in particular environments, and the impact of these activities on individuals are all neglected in the social address model (Bronfenbrenner & Crouter, 1983). The *person-context model* examines both the individual and the context but

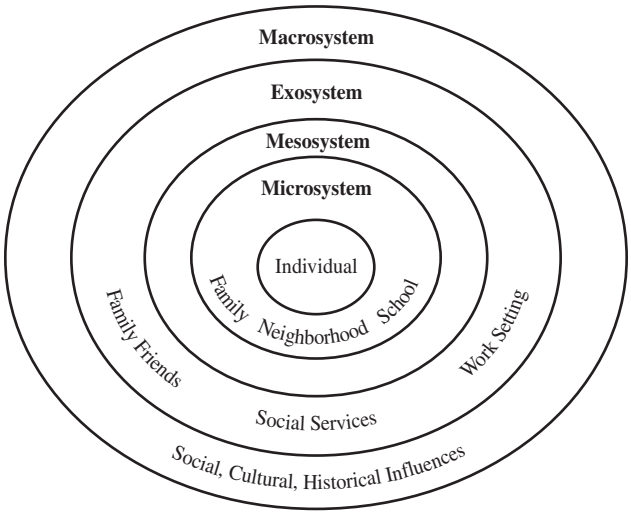


Figure 15.19 Bronfenbrenner's Ecological Systems Theory. *Source:* From "Ecological Systems Theory" (pp. 187–248), by U. Bronfenbrenner, in *Annals of Child Development.* R. Vasta (Ed.), 1989, Greenwich, CT: JAI; and "The Ecology of Cognitive Development" (pp. 3–44), by U. Bronfenbrenner, in *Development in Context: Acting and Thinking Is Specific Environments,* R. H. Wozniak & K. W. Fischer (Eds.), 1993, Hillsdale, NJ: Erlbaum.

does not analyze the processes involved in development. This model specifies ecological niches (Bronfenbrenner, 1989), but it does not delineate the processes by which developmental outcomes are attained.

Bronfenbrenner's (1979, 1989, 1993) ecological systems theory, in contrast, is a *process-person-context model* that, like the bioecological model, highlights variability in developmental processes as a function of the characteristics of the person and the environment. Ecological systems theory is organized in four levels of environment, which mediate person-environment interaction: *microsystem, mesosystem, exosystem,* and *macrosystem* (refer to Figure 15.19). The first level of Bronfenbrenner's model, the *microsystem,* involves the interaction of the person with the immediate social and physical environment: home, family, or school settings. All of the levels of environmental influence are filtered through microsystems, where actual experiences take place. *Proximal processes,* earlier defined in the bioecological model as the mechanisms through which genetic influences are actualized into observable phenomena (Bronfenbrenner & Ceci, 1994; refer to Figure 15.18), are essentially patterns of person-environment interactions in the *microsystem* and change during the development of the person (Bronfenbrenner, 1979, 1989, 1993). The *mesosystem* describes interactions between the various microsystems in a person's life, essentially constituting the network of interpersonal relationships that overlap across the various settings. The *exosystem* entails more distal influences, including the structure of the community where the person resides and settings where the person is not directly involved. Finally, the *macrosystem* is comprised of the larger societal institutions, such as government, economy, media, and so on, which lay the social and historical context for development (Bronfenbrenner, 1979, 1989, 1993).

Spencer and Harpalani's (2004) analysis suggests that ecological systems theory provides a dynamic, contextually sensitive framework from which to analyze environments and gene-environment interactions. It can be applied to shed light on the behavioral genetic theorizing noted earlier. For example, to the extent that they can occur, the active and passive effects of gene-environment correlation (Plomin, DeFries, & Loehlin, 1977; Scarr & McCartney, 1983) primarily involve the lower levels of the model. Individuals may have some ability to shape their own environments and those of their relatives (perhaps based on their genetic makeup) at the level of the microsystem, and perhaps even at the mesosystem. However, individuals are by definition not involved in their exosystems of development, and notwithstanding a few extraordinary examples (e.g., Dr. Martin Luther King and Mahatma Gandhi), few can influence the macrosystem. Broad, societal influences such as structural racism (Spencer, Cross, et al., 2003; Swanson, Cunningham, & Spencer, 2003) and racial stereotyping (Harpalani, 1999) are filtered through macrosystems to impact the development and experiences of minority youth. Regardless of their genetic makeup, individuals can do little to eliminate these factors. Even more mundane situations of stress—such as being ignored in commercial venues (e.g., not provided service) or followed and closely monitored in a place of business may be cumulatively experienced as "microoppression"; given their patterned and persistent impact, the cumulative exposure can have a significant impact on stigmatized groups such as African Americans (e.g., Carroll, 1998).

In addition to the uncontrollable effects of the macrosystem and their impact on everyday experiences, the ability to shape immediate environments is limited for many youth. For example, Stevenson (1997) de-

scribes how African American youth are "missed" and "dissed" by mainstream American society, and how this treatment in conjunction with neighborhood factors relates to African American youth becoming "pissed" while managing their anger. Black youth are missed as stereotypical media-based images distort the meanings of their social and affective displays—usually in negative terms. Hence, these unique cultural displays are devalued and viewed with insolence—dissed. These are effects of the macrosystem that cannot be regulated by individuals. In conjunction with these misrepresentations, many Black youth reside in high-risk contexts where anger display may be an appropriate coping mechanism. Anger may indeed become a form of competence for social and emotional viability in certain high-risk contexts, such as neighborhoods, which are microsystems. These displays may also be misconstrued or constitute inappropriate behavior in other microsystems such as school settings. Hence, misrepresentation, disrespect, and hazardous contextual factors at various ecological levels interact in creating the anger of Black youth (i.e., pissed). Phelan et al. (1991) describe how dissonance between various microsystems—hence, at the level of the mesosystem—can impinge on resiliency and health development.

It is useful to consider the role of the genotype in ecological systems theory. Ecological systems theory focuses on delineating environmental influences rather than genetic influences. The genotype (i.e., genetic makeup), is an implicit component that Bronfenbrenner obviously considers but does not identify explicitly in his model. This is probably because the genotype involves only the person and not person-environment interaction; it is not changed by environmental influences. Indeed, focus on the genotype in part leads behavioral geneticists to often take a rather static view of human development. However, as reviewed by Spencer and Harpalani (2004), the important component in development may not be the genotype itself, but rather its expression (i.e., phenotype). The expression of the genotype is dependent on environmental interaction, and this expression cannot be determined accurately without actually observing the particular genotype being expressed in a given environment (Gottlieb, 1995). While the genotype is an important and measurable component in developmental analysis, its expression (and thus its true impact) should be considered in conjunction with environmental influences and developmental processes. Specifically, cognition-linked perceptions matter.

For twentieth-century America, there have been few proximal processes left unaffected by the particular gene expressions manifested as *skin color* (see Franklin, 1968). Additionally, there have been sets of attendant historical conditions created (Du Bois, 1903), socially constructed meanings made of race (Pettigrew, 1964), associated professional practices and perspectives produced (e.g., Kardiner & Ovesey, 1951), and policy decisions determined (see Crenshaw et al., 1995). However, *few policy changes up through the last century have been more pregnant with meaning for youth of color than* Brown v. Board of Education. Consistent with the perspectives shared about immigrant youths' experiences, immigration policy has had parallel influences on the lives of American newcomers.

Unfortunately, there is inadequate space for a thorough and integrated coverage of the many salient immigration policies of relevance for contemporary child development outcomes of special relevance particularly for marginalized youth. However, excellent reviews are available. Prashad's (2000) analysis has particular salience for the contemporary experiences of South Asian Americans. Further, many of the early policy decisions remain especially significant for today's newcomers given the greater within-group diversity and relevance of the historical timing of arrival for particular waves of immigrants. The within-group diversity of values, beliefs, global economic factors, and perspectives along with inferences and stigma held by the broader society (e.g., model minority stereotypes) have particular relevance for the experiences of all youth of color and immigrants, particularly more recent arrivals (e.g., Hmong) and second-generation Asian Americans (e.g., see Koshy, 1998).

Yet, independent of their actual authenticity, *social constructions and inferences* made about the psychosocial functioning of diverse group members *matter.* They represent the Zeitgeist held about diverse group members' social standing and inferred psychological well-being. Most important, from a PVEST perspective that acknowledges the central role of ecological and phenomenological factors, *externally based assumptions and assessments* of salience to policy matters may actually *function in opposition to their intended role.* As significant influences on policy decisions, particularly in the case of undervalued (marginalized) youth and families, manifested policies may inadvertently serve as sources of risk as opposed to their desired and intended protective function (attenuating the significant social vulnerability of particular citizens).

TWENTIETH-CENTURY SOCIAL SCIENCE ASSUMPTIONS AND PRACTICES, JUDICIAL DECISIONS, AND THEIR IMPLICATIONS FOR THE NET VULNERABILITY OF DIVERSE YOUTH

As a basis for providing alternative and inclusive human development theorizing relevant to diverse youth, we described the benefits of PVEST. A major rationale supporting the framework's use is its applicability to all individuals irrespective of group demographics (e.g., economic status, race, ethnicity, nativity, and immigration status). The framework's inclusive character represents an important benefit because the literature narrowly and frequently infers deviance, pathology, and problems for those categorized as different (i.e., from the accepted and nonstigmatizing norm of being Caucasian and middle income). As described, the early research on Black children was conceptually flawed in multiple ways (see Spencer, 2005). And at the same time, traditional and widely disseminated child development research efforts assumed the findings to be representative of all youths' experiences (i.e., diversity within-group is generally not inferred). Specifically, the operating perspective suggests that European American experiences represent the normative standard for all. For the most part, process-oriented developmental analyses have been restricted to middle income people or European Americans. Conversely, problem- or pathology-oriented outcome-focused studies have primarily been assumed as representing the experiences of minorities in the social science literatures generally but continue to characterize the developmental sciences specifically.

Inferences, Assumptions, and What *Brown v. Board of Education* Should Have Considered: Contemporary Implications for Research, Practice, and Theorizing

The pattern of published research suggests specific assumptions such as an unacknowledged status of privilege for some (i.e., and who represent what is thought of as normal for all), and an inferred homogenous experience of atypicality for most others. Inferable from the developmental sciences is that normal remains the provenance of European Americans and middle-income people. At the opposite end of the spectrum, marginalized group members are conceptualized as the other. Erroneously, their experiences are assumed to be *homogenous as the minority case,* and as suggested, they are most frequently represented in the literature under categories of deviance, difference, problems, pathology, and deficit (see Spencer, Brookins, & Allen, 1985). Moreover, the two juxtapositions frequently ignore the multiple contributions of the social and physical ecology: Except for *crediting* diverse youth of color for the character of the context, and thus, the source for the group's high vulnerability (higher risks than available protective factors).

Unfortunately, as such, this latter perspective continues to the disadvantage of some youth (i.e., immigrants, low-income families, and youth of color) because it communicates the penchant that individuals are solely responsible for their own social situations. The working notion reinforces the stereotype that the problem or major sources of risk reside in individuals who deterministically create their own environments. Thus, the assumption is that they are responsible for their own disadvantaged situation. The stereotypes reinforced by narrow and under-representative scientific efforts have failed to contribute to inclusive theorizing, proactive research traditions, or culturally authentic programmatic applications that adequately address and enhance human development stage-specific outcomes for diverse groups. As a process-oriented, culturally sensitive and identity-focused framework that addresses the "how" (which is important for application), PVEST aids in filling the long-term void described by S. H. White (1996), Cole (1996), Lee et al. (2003), and others.

S. H. White's (1996) chronicling of the history and cultural shortcomings of contemporary research suggests a significant lack of inclusive thinking. The ICE perspective provided by PVEST in response, given S. H. White's critique, brings attention to the patterned *lack of cultural competence and generally inadequate research perspectives* (including acknowledgment of the broad diversity both within and between groups). Infrequently acknowledged, except to occasionally lament their existence, the problematic conduct, character, and interpretation of such programs of research remain endemic to the social sciences and have been highlighted more recently as "outcome disparities," particularly in the education and health literatures. As a consequence, given the shortcomings noted, *social policies* themselves have *provided neither the conceptual leadership nor the social and psychological protective* functions usually intended or inferred from good social policy.

At the same time, the broad privileges associated with middle and high socioeconomic status and European American group membership continue to be underappreciated and more frequently generally ignored (see McIntosh, 1989). Luthar's (2003) program of research with affluent Caucasian suburban youth provides the potential for new beginnings for understanding the special character of vulnerability experienced by privileged youths. Similar to Roediger's (2002) analysis, equally relevant is Moore's (2002 and documentary, http://www.bowlingforcolumbine.com) perspective concerning school-based mass killings such as the one at Columbine High School. Given his analysis, evidence for a downside of privilege begs attention. Generally speaking, questions concerning the relationships between privilege and underdeveloped coping skills are needed for the design and implementation of intervention and prevention strategies. Inadequate coping responses to many common but painful adolescent or childhood stressors, such as teasing and marginalization, are inadequately addressed in the literature, particularly as they relate to privilege, coping strategies, and completed suicide rates. This oversight in the child and adolescent literatures is especially troubling, given that White males on average have the highest completed suicide rate among adolescents and individuals in middle adulthood (see Carroll & Tyler, under review). On average, however, they are also expected to obtain the highest life course earnings and complete the most years of education. Accordingly, high suicide rates among White males in adolescence and middle adulthood (see Carroll & Tyler, under review) appears inconsistent with other indicators of mean successes accrued. This disparity suggests the need for intervention/prevention strategies and analyses that differ from those assumed for marginalized youths and particularly males.

Speculations about the challenges faced by youth of color and low socioeconomic-resourced youth may be more readily associated with *the lack of opportunity,* economic difficulties, and underserviced neighborhoods. Irrespective of the many challenges and the media exploitation of obvious coping failures, the majority of young people successfully tackle the developmental tasks described by Havighurst (1953). Their successes are generally underacknowledged; in fact, their resiliency amidst persistent challenges suggests that many demonstrate carefully honed adaptive coping skills. Resilient outcomes, however, are not solely dependent on environmental influence. The variability of coping success and failure often occurs in the same family, where environmental influence may be similar across siblings (one son becomes a medical professional and a second becomes an inmate in jail). A particular strength of PVEST is its capacity for understanding the unique experiences of each sibling by including the consideration of phenomenology. Youths' meaning-making can be totally different even if, for example, brothers are believed to be exposed to the same parental messages, ecolevel structural conditions including the character of neighborhood resources and challenges.

Additionally, explicit experiences of cultural socialization and carefully developed strategies of parental monitoring predict positively to healthy emergent identities and developmental stage-specific coping products (e.g., completing school, obtaining employment, living a healthy lifestyle; Spencer, 1983, 1990; Spencer et al., 1996). Thus, given the variability possible, context-linked challenges confronted, and coping processes evoked (i.e., independent of shared demographics, child-rearing, and schooling environments), both within- and between-group diversity of outcomes is possible. Inclusive conceptual frameworks should be amenable to and effective in explaining the "how" of (a) youths' unique meaning-making processes that govern coping and identity processes, (b) their active usage or self-restraint of opportunity structures (e.g., optimizing or pushing back from educational options provided through public schooling), and (c) children's broad range of within-group behavioral variation. The wide spectrum of adaptive coping prospects are not independent of the fact that youths, as they transition across time and place, may be burdened with stereotyping encounters or stigmatizing imagery (i.e., of themselves or their referent group) and limitations of proactive or adaptive coping experiences given assumptions frequently associated with privilege, or its absence. Moreover, youths' ensuing social epistemologies that result (i.e., given stage-specific developmental variations in youths' perceptual processes and phenomenology) promote further variability in coping strategies available and outcome options.

As inferred from Chestang (1972), the persistent encounters with hostile environments are often based solely on group-linked stigma such as race, gender, low socioeconomic resources, skin pigmentation, ethnicity, and immigration status. We suggest that how young people make meaning and cope with challenges require dynamic, recursive, and culturally sensitive interpretive frameworks. These conceptual advantages promote the

design, determination, and construction of the most appropriate and effective prevention/intervention supports. PVEST serves as an effective conceptual tool for describing the range of coping strategies possible and aids in determining the character of coping options that an individual might use in the moment. Some responsive strategies might evoke jail-time sentencing decisions by the judicial system (e.g., see Stevenson, 1997) or precipitate effectance motivation that can lead to youths' high levels of success and competence (e.g., see R. White, 1959, 1960). The *range of reactive coping responses possible* may result in resiliency for some (i.e., positive outcomes in the face of inordinate challenge) or produce unfortunate labeling and unproductive coping products that lead to the oft-reported group disparities for a particular characteristic (e.g., academic underperformance, health status, special education placement, and disproportionate sentencing to the criminal justice system).

In contrast, the several mass school shootings over the last decades, most recently that at Columbine High School (Moore, 2002 and documentary, http://bowlingforcolumbine.com), certainly make the point of privileged youths' understudied but apparent vulnerability, which is consistent with the patterned suicide rates for White males. Although generally lacking parallel media coverage, which is frequently reserved for mishaps committed by low-resource youth, particularly youth of color, these unfortunate situations also fall into the category of *unproductive coping processes and outcomes.* Their patterned quality for privileged youth suggests a particular level and character of vulnerability. Although not generally discussed, these themes deserve theory-driven scholarly analyses for informing intervention and prevention efforts. As most evidenced by stereotyping of marginalized youth, there is a potential downside to bringing attention to a specific need because the resulting stigma increases individuals' experiences of risk and underscores the need for additional protective factors.

For example, the media acknowledges and highlights particular disparities, which further stigmatizes referent group members and can lead to situations of stereotype threat (Steele, 1997, 2004; Steele & Aronson, 1995). Accordingly, a theoretical perspective relevant to *diverse youth* (i.e., both privileged and those inordinately challenged) should accommodate the exacerbating impact of (a) maturation-linked complexity (e.g., early versus late physiologic maturation; Spencer, Dupree, Swanson, & Cunningham, 1998), (b) transactional-determined dynamism (i.e., individual-context interactions; e.g., awareness of bias; Spencer, 1985, 1999b, 2001), and (c) cultural embeddedness (e.g., Lee et al., 2003). The efficacy of a theory as a process-oriented conceptual tool should aid in explaining the "how" of outcomes, given the breadth of experiences possible and the persistence and character of situations under which many children struggle and have little control. For example, the traditional literature on service learning and volunteerism positively acknowledges and credits supports provided by youth only if provided to others or nonrelated groups. For some children, the garnering of official approval, support, and recognition for *service learning provided to their immediate or extended family system and community* is equally important and should earn equivalent psycho-social benefits and academic reward to youth when compared against service provided to unknown others (Spencer & Cassidy, 2004).

Given the salient role of *context,* PVEST satisfies criteria for good theory as suggested by S. H. White (1996). Specifically, it accommodates the consideration of traditional externally based information about study subject(s) such as *neighborhood and community characteristics and assessments.* These are frequently obtained through "windshield" observations of context or similar strategies. This information resource is particularly relevant for studies of older middle childhood youth and especially adolescents who transition across neighborhoods as an aspect of the developmental task requiring the establishment of broader social relationships. Parental reports and other interview data sources are also useful context-based information in answering the "how" question from a PVEST perspective. Achievement testing process and outcome data represent an additional context-linked data source on par with teacher ratings. Considered together, PVEST provides an analysis, which includes the individual's own view as well as the transactional contributions of the context; thus, it provides an ICE perspective that represents a valuing and recognition of the individual's own perspective or phenomenology considered from within the cultural context.

The varied meaning-making, coping processes, and emergent identities of youth may be associated with several possible levels of environmental hostility or racism, which are contributed to by social infusions of what Steele and colleagues (Steele, 2004; Steele & Aronson, 1995) characterize as "stereotype threat" or inferred hostility (see Chestang, 1972). Further, when considered developmentally, the responsive coping

styles may be highly heterogeneous in character and do not necessarily include the internalization of negative affect assumed by the larger society given the group's social placement and denial of rights (see Spencer, 1990; Spencer & Markstrom-Adams, 1990; Swanson, Spencer, Harpalani, Noll, Seaton, et al., 2003). From a policy perspective, the nuanced and developmental-sensitive perspectives published in the past 25 years were not in place when the Courts determined *Brown v. Board of Education* in 1954 (see Cross, 1991). *As a major historical event, the decision's salience and aftermath greatly influenced social and educational policy, practice, and legal decisions. Most important, the decision continues having significant relevance today—50 years post*-Brown.

Shortcomings of Mid-Twentieth-Century Social Science Contributions to the Brown *Decision*

The research efforts of Kenneth and Mamie Clark (1939, 1940) were cited as a footnote in the U.S. Supreme Court's landmark *Brown v. Board of Education* decision (see Lal, 2002). The published scholarship and known programs of research available at the time were used to support the notion that Black children developed a low self-esteem due to segregation, and that integration was necessary to mitigate feelings of inferiority. The 50th anniversary of that decision suggests an appropriate point to integrate, revisit, and reanalyze the legislation's impact for youth development but particularly for marginalized youths' academic experiences and outcomes in U.S. school settings. The power of better theory for interpreting the Clark's research without either castigating the researchers or pathologizing the children is overdue. The case enlightens both the importance of training diverse investigators and having authentically inclusive human development theory for interpreting findings and enhancing the efficacy of policy decisions for the common good.

Jack Balkin's (2001) edited volume, *What Brown versus Board of Education Should Have Said,* reports on his request of a group of constitutional scholars to rewrite the opinion in *Brown v. Board of Education.* He asked the specific question, "How would you have written the Brown opinion in 1954, if you knew then what you know now about the subsequent history of the country and the progress of race relations in the past half century?" (Balkin, 2001, p. ix; Note: It should be acknowledged that the opinion called *Brown* is actually based on three opinions: *Brown I,* May 17, 1954; *Brown II,* May 31, 1955; and *Bolling v. Sharpe,* May 17, 1954.) Balkin (2001) instructed participants to draft an opinion (a majority opinion, concurrence, or dissent) *based on the material available in 1954.* The contributors addressed three sets of issues. Given feedback and overall case analysis, Balkin argues that *Brown* is one of the most recognized and treasured court decisions in history. He states:

> The civil rights policy of the United States in the last half century has been premised on the correctness of *Brown,* even if people often disagree (and disagree heatedly) about what the opinion stands for. No federal judicial nominee and no mainstream politician today would dare suggest that Brown was wrongly decided. At most they might suggest that the opinion was inartfully written, that it depended too much on social science literature, that it did not go far enough, or that it has been misinterpreted by legal and political actors to promote an unjust political agenda. The use made of *Brown* is often criticized, but the idea of *Brown* remains largely sacred in American political culture. (Balkin, 2001, p. 4)

However, as recently analyzed (see Spencer, 2005), the sentiment described was clearly not evident in the first decade following the decision; indeed, there was much upheaval over the decision. Many opponents argued that it was more a sociological rendering than a legal decision, claiming that it ignored history and legal precedent. The South raised massive resistance claiming that *Brown* was an abuse of judicial power. However, *Brown* has gradually come to be highly esteemed. Balkin (2001) claims that the decision falls in line with the U.S. "Great Progressive Narrative," which states that the United States through its Constitution and through history is gradually reaching its social justice goals and that the United States is essentially a just society and that through struggle and history these goals will be realized. The fame of *Brown* is ironic, in that today, many public schools remain segregated by race and are often taught by teachers who have difficulty educating certain children, particularly those with whom they lack history (see Ladson-Billings, 1994). During the 1970s and 1980s, southern schools were rapidly desegregated turning the south into one of the most integrated parts of the country. However, more recently there has been resegregation of schools based primarily on differential resources structured demographically along the poverty line, and the penchant has visible racial consequences.

The pace of desegregation slowed in the middle 1970s, in part, because of Supreme Court decisions that failed to regulate desegregation across primarily White suburb and minority inner city boundaries. For example, *Milliken v. Bradley,* 1974, in Detroit, "freed white suburban districts from any legal obligation to participate in metropolitan desegregation efforts" (p. 6). Despite these court implications, desegregation actually continues into the 1980s. As chronicled by Balkin (2000), during the 1990s, however, the Supreme Court actively restricted their supervision of school districts with:

- 1991, *Board of Education v. Dowell:* The Supreme Court held that "courts could end desegregation orders in school districts that had attempted in good faith to comply, even if this would result in immediate resegregation" (p. 6). The replacement of Justice Thurgood Marshal (major civil rights supporter) with Justice Clarence Thomas in 1991 gave further impetus to this trend of restricting court supervision.
- 1992, *Freeman v. Pitts:* The Supreme Court held that "courts could end some aspects of school desegregation orders even if other aspects had never been fully complied with" (p. 7).
- 1995, *Missouri v. Jenkins:* The Supreme Court "overturned an ambitious plan for magnet schools in Kansas City designed to attract white students back into inner city schools" (p. 7).

Two salient implications and consequences of these Supreme Court rulings ensued: (1) The federal court's desegregation orders have been largely stopped, and (2) districts technically subject to court orders face no enforcement activity. Thus, in the 1990s, there has been a tendency to resegregate. An implication is that schools can be segregated by race as long as the status is not due to direct government impetus. In his analysis, Balkins (2001) states that "racial segregation today is the result of a complicated mix of social, political, legal, and economic factors, rather than the result of direct state commands ordering racial separation . . . it remains overwhelmingly the case that minority children in central cities are educated in virtually all-minority schools with decidedly inferior facilities and educational opportunities" (p. 7). *Evident is that Brown called for the importance of equal educational opportunity; however, it is evident that minority students do not receive an equal education compared to that provided by public schools in wealthier, Whiter suburban districts.* As a major and consistent source of risk, the schooling contexts are not equivalent for youth of color versus privileged youth. However, achievement gap language implies that it is an individual's own performance inadequacy that is the culprit rather than sets of *policy determined, constructed, and supported social inequities.* Accordingly, inclusive and sensitive theorizing matters for producing the most beneficial policies and practices.

Traditional Assumptions, Beliefs, and Values: The Conceptual Benefits of a Phenomenological Variant of Ecological Systems Theory Framework

Given the process-emphasizing rendering of PVEST in Figure 15.12, good developmental theory appears important because it explains *how* youth respond to externally imposed inequities and cope with adverse ecological conditions or what Chestang (1972) refers to as character development efforts pursued in persistently challenging environments. *Brown* has come to mean different things to different people: It has also been used in diverse ways by different groups. *Brown* was implemented to support public equity in buses, pools, restaurants, and retail outlets (i.e., all important contexts of socialization and youth development) and has become a symbol of equality generally, beyond racial equality. This is both interesting and informative given the intent of the originating cases.

Brown opposed *Plessy v. Ferguson,* 1896, which allowed for segregation of public spaces and gave justification to Jim Crow. The only Justice to oppose this decision was John Marshall Harlan who maintained that this country should not support a caste society and that it should be color-blind. His words have been applauded by civil rights supporters. However, more recently, the differences between *anti-classification* and *anti-subordination* have become more apparent and are exceedingly important for youths' developmental opportunities and experiences. As one example, there are those who support classification in affirmative action to promote Black equality (see Balkan, 2001).

According to the anti-subordination approach, the question is not whether the law classifies by race, but rather whether the law is *doing anything to remedy subordination or whether it is doing something to enhance it.* Anti-classification, because the law does not currently

directly impose classification, actually *tends to work to perpetuate Black inequality because it fails to acknowledge the differential ways in which Blacks have suffered cumulative effects and continue to be burdened by social and economic subordination.* Thus, this tends to sanctify the many *indirect practices that subordinate Blacks,* without directly classifying: "It encourages people to explain persistent black inequality as the result of private choices, cultural differences, or black inferiority rather than at least partially as the result of facially neutral legal policies that help preserve social stratification" (Balkin, 2001, p. 13). *The New York Times* (Rimer & Arenson, 2004, June 24, Sec. A, P1) described analyses by two Harvard researchers, Skip Gates and Lani Guanier. The researchers suggest that selective school attendance by Blacks represent immigrant Blacks and not indigenous Blacks for whom the *Brown* decision was targeted. The admissions profile favoring immigrants imply efforts to satisfy the law without considering its spirit and the variability of experience by ethnicity and immigration status *within race.* The admissions profile and its implementation by respective selective college's admissions office provides a powerful illustration of the broad manipulation of opportunity thus suggesting that supports are not always supportive to those actually intended to benefit. Selective postsecondary schools of higher education such as Harvard, Yale, and Princeton communicate a solid track record of admitting Blacks. However, the admissions procedures in practice at select schools, in fact, admit Blacks of first- or second-generation immigrant status whose academic record and schooling experiences lack the cumulative intergenerational effects of long-term U.S. race-based hostilities, which the *Brown* decision sought to remedy.

The broad controversy between color-blindness and equal citizenship extends into every part of antidiscrimination law and policy. Each side substantiates their claims in *Brown.* Balkin's (2001) analysis of the feedback suggests an important role for the politicized views of the moment. Actually, the Balkin perspective underscores the powerful role of the political-ecology and contends that the Court rulings coincide very smoothly with the political climate and are not, as some have argued, free from this context. Even *Brown* was not revolutionary in an isolated sense. From a global and broad psycho-historical perspective, it was relevant to the Cold War climate and the image U.S. leaders wanted to present abroad to diminish criticism of Jim Crow: Using Chestang's (1972) analysis of the ecology, the goal was to suggest a less hostile context of development for those suffering under Jim Crow practices. *Brown made sense as a blow to communism and to demonstrate the democratic tenets of our constitution and the ways the United States upholds these despite its lived societal inconsistencies.* Considered from a PVEST perspective, the penchant produces a level of official deniability relative to responsibility for diverse youths' life course coping patterns, processes, and outcomes.

Many critics maintain that the view of the Supreme Court as brave and a progressive, counter-majoritarian institution is largely a myth and that is does not work to favor minorities in the face of majority opposition. As Derrick Bell (cited in Balkin, 2001) maintains, *Brown* is congruent with his "interest convergence thesis," which maintains that advancement for Blacks will only occur if these advancements are in White interests. Bell argues, "ending Jim Crow—at least formally—was in the interests of northern whites and the foreign policy establishment. However, the convergence of interests between blacks and white elites did not mean that whites had an interest in full social and economic equality for blacks, and the limited convergence of interests that did exist did not last. Actual desegregation remedies were a long time in coming and fell far short of providing genuinely equal educational opportunities for blacks" (see Balkin, 2001, p. 22). From a child development and parental socialization perspective, an understanding of such nuanced analyses is required and itself represents an unfair burden for minority group and disenfranchised parents. Appropriate use of the legal insights requires an ability to translate complex policy-relevant information into particular parenting strategies: For parenting of European American or well-resourced youth, a goal would be to counteract easily inferred privilege assumptions by young people. For poor and marginalized youth, the goal would be to monitor and support youth development in ways that would reinforce effectance motivation and model adaptive coping strategies needed for responding to socially unacknowledged, unfair, and ethnicity-linked challenges.

Critics maintain that *Brown* is a symbol of how ineffective the Supreme Court is at promoting social change. They argue that the lack of implementation and the reversal in the 1990s demonstrates the ineffectiveness of judicial change. For example and as reported by Balkin (2001), Rosenberg in his 1991 book, *The Hollow Hope:*

Can Courts Bring about Social Change? argues that *Brown*'s role in promoting equality has been overstated. Rosenberg suggests that enforcement did not proceed until the Civil Rights Act of 1964 and rather that *Brown* instigated a forceful resistance from southern Democrats. Also, critics oppose the view that *Brown* initiated the civil rights movement, naming the many grass-roots efforts that proceeded *Brown.* Balkin (2001) claims that legal precedent such as Brown is important in that it structures the discourse that can ensue. *Brown* provided a symbol, linking the Constitution and rule of law to civil rights and racial equality. Balkin maintains that *Brown* is currently very important and the argument is not over whether it was correct, but rather, contesting its meanings and implications. Interestingly, 50 years later, the argument is whether the underlying principle of constitutional equality provided by *Brown* is *anti-classification* or *anti-subordination.* "Is the real evil of Plessy the classification of persons by race or is it the subordination of one race by another?" (Balkin, 2001, p. 55). Following the *Brown* decision, there were no provisions for equalization and true integration, rather the specified legal doctrine noted that states could not assign pupils based on race alone. Many states adopted choice plans and the use of private schools to avoid directly contesting *Brown.* Balkin states, "Indeed, because the schools were technically 'desegregated' once overt assignments by race ended, one could argue that there was no continuing obligation to equalize facilities between schools; he notes that the situation might be even worse than it was before Plessy" (p. 65). Importantly, there has been little discussion in the youth-focusing social sciences about the impact of these events on the psychological context of child development *research,* on everyday coping experiences in the daily lives of children, or on the myriad levels of youths' socialization contexts.

In the 1990s, significant disillusionment surrounded *Brown,* given that a majority of Blacks still receive substandard education in deteriorating schools and that the push for desegregation for the most part has been rejected. In particular, public schools in urban areas continue to be mostly Black: "In 1998–1999, 90% of the public school students in Chicago were African American or Latino; 83% lived in poverty-stricken households. In Detroit, 90% of public schools students were black and 70% were poor enough to qualify for free school lunches; more than one-half of the city's students did not graduate from high school" (Balkin, 2001, pp. 211). In addition, many large school districts, including Cleveland, Dallas, Denver, Minneapolis, and so on, "were allowed by judges in the late 1990s to phase out or terminate court supervision" (p. 212). Hence, integration of schools vastly declined in the late 1990s.

Several court decisions in the late 1990s ended efforts to desegregate (e.g., busing) and also ended race-based decision-making in many schools, thus canceling affirmative action practices. Data indicate that gaps between Black and White achievements are increasing again in the 1990s after slightly decreasing in the 1970s and 1980s. However, the data also suggest that the gaps remain even in districts that are integrated and of a higher economic status. Family structure, income level, and educational level did not seem to alter these gaps.

Cross-Disciplinary Contributions from Legal Studies

Like Balkin, Sarat (1997) argues that *Brown* challenged legal precedent and rearranged the ways in which the law could work toward progressive change in society. Sarat states: "*Brown* was at once a turning point and a source of resistance, a point of pride and an object of vilification. Its legacy, like the legacy of all great historical events, is, even today, contested and uncertain" (p. 5). Although not acknowledged, it is evident that a strong legal position continues to be the problem of subordination: Racism, stereotypes, and low expectations continue to haunt particularly Hispanic and Black children as an integral and persistent aspect of their social ecologies. Importantly, *theories of development that guide the training of teachers in pre-kindergarten through 12th grade and beyond neither adequately nor authentically represent the individual-context experiences of diverse youth.* Parents frequently appear equally handicapped in providing the necessary supports as counteractions against race-linked challenges. Teachers and administrators not only miss adequate training information about youth of color but also are frequently not accountable for analyzing their own internalization of subordination beliefs. Except for the scholarly thrust of the CRT initiatives, Whiteness studies (in general), and White-privilege perspectives (specifically), there remains a strong pattern in social science and developmental science to inadequately consider race or to attempt to minimize or to statistically control for its impact on youths' coping processes.

Critical Race Theory (CRT): Contributions and Limitations

Another important development in scholarship on racism, CRT (Delgado & Stefancic, 2001), draws its origins from legal studies and represents another historically important innovation. CRT began as a critique of liberal post-civil rights ideology that de-emphasized the role of race in U.S. society. The CRT movement has drawn attention in a variety of academic disciplines, including education, the humanities, and the social sciences. In parallel with sociological theorizing, CRT highlights racism as a normal component of society, not an aberration, and examines the subtle racial interests and tangible consequences of legal decision-making and policy in a society marked by racial hierarchy. Additionally, CRT scholars often use rhetorical devices and narrative storytelling, often autobiographical, to illustrate everyday manifestations of racism and their connection to broader, structural forces. As a representation of a phenomenological perspective, CRT begins to link individual experiences with societal theories of racialization, integrating the structural, ideological, and material expressions of racism in the routine course of daily life.

Critical Race Theory: Tenets, Analytic Applications, and Theoretical Renderings of Race. As a movement that is both theoretical and activist oriented, CRT arose from the discipline of legal studies. CRT departs from many other disciplinary regimes as it attempts to name the inequities in our current social structure and then re-envision the categories and assumptions that we as society use to frame our world. Formally begun in the mid-1970s through the founding work of Derrick Bell (e.g., Bell, 1995, 2000a, 2000b) and Alan Freeman (e.g., Freeman, 1995), CRT poses critiques that disrupt the blinders that social systems create in an attempt to *make racism invisible.* The perspective forces an acknowledgment of the ways in which discourse and social structure cooperate in the realization of inequities and racism.

The CRT approach was situated in a particular historical period and arose primarily as a dialogue with and in response to the civil rights movement. The theorists were critical of the changes brought about by this movement, in particular, the lack of steady advancement in racial reform in the United States. Regarding the more recent retrogression of progress that have been made since earlier legal gains (Delgado & Stefancic, 2000), Bell (1999a) indicates that "statistics on poverty, unemployment and income support the growing concern that the slow racial advances of the 1960s and 1970s have ended, and retrogression is well under way" (Bell, 1999a, p. 2).

CRT, as a discipline, is based on the foundations laid by critical legal studies and feminism and its intellectual ties extend back to U.S. thinkers, such as W. E. B. Du Bois, and European theorists such as Gramsci and Derrida (Delgado & Stefancic, 2000, 2001). From a PVEST perspective, it delineates the role of race for vulnerability and demonstrates the countless ways in which race for youth of color increases net stress level through its manifestation of subtle and explicit daily challenges borne by youth and their families. CRT questions the very foundations of legal reasoning, and although CRT still predominantly produces new legal discourse, analysis is now applied more broadly in fields, such as education, where the tenets of CRT are used to understand tracking, curriculum, and the history of IQ and achievement testing (Delgado & Stefancic, 2001). Thus, from the child and adolescent development perspective of the social sciences, CRT provides an important and generally overlooked *contextual perspective* by defining it in race-linked terms. CRT is inherently nondevelopmental; however, it provides lenses for articulating the influence of racism and stigma as a presence and potential impact on normative developmental tasks pursued by youths. Its inclusion and or consideration represents a significant variation from traditional child development approaches that attempt to clarify the salience of race through statistical strategies that categorically defines the impact of race for hypothesized outcomes. Further, as a statement about everyday practice as supported by the law, CRT specifies the differential character of race-based practices as experienced by marginalized youth. When considered from a PVEST perspective, CRT provides a service to the social sciences by fully specifying the varied contributions to vulnerability level as experienced by diverse youth. As supported from legal studies, the perspective specifies the contributions to the high-risk context of development as experienced by youth of color and, at the same time, specifies the implicit protective character of racial group membership particularly for European American children.

CRT incorporates two main concepts from the field of critical legal studies. First, *legal indeterminacy* acknowledges the subjectivity of legal outcomes and maintains that "not every legal case has one correct outcome"

(Delgado & Stefacic, 2001, p. 5). *The legal outcome depends on whose interpretation is privileged, which is dictated by the power and authority of various interpretations.* Second, *favorable precedents* tend to erode over time due to the ways in which lower courts interpret precedents using narrower definitions and because of the general lack of enforcement of legal doctrine (Delgado & Stefacic, 2001).

CRT also incorporates concepts and terminology from feminism. Specifically, it applies theoretical feminist views on power, the construction of social roles in society, and its use of hegemony. As reported by Hall (2000), the concept of *hegemony* was developed by Gramsci and is defined as "total social authority" acquired through the combination of *coercion* and *consent* at the economic, political, ideological, intellectual, and moral levels. CRT also works in the feminist premise that legal and social theory have practical consequences in society and that these consequences must be addressed (Armour, 2000; Delgado & Stefacic, 2001).

Delgado and Stefancic (2000, 2001) summarize four underlying tenets of CRT. The first tenet maintains that "[R]acism is normal, not aberrant, in American Society" (Delgado & Stefancic, 2000, p. xvi). As opposed to being relegated to the undifferentiated level of the ecology described by Bronfenbrenner as the macrosystem, instead, racism is conceptualized as an intricate part of the everyday life experiences in the United States and is woven into all institutions and social interactions. It is an ingrained aspect of our society to such an extent that racist practices and interactions are deemed as normal. Most important, as understood in the social sciences generally and child research specifically, the roots of these injustices are ignored or frequently not perceived. Formal equal opportunity rules and laws target extreme, overt injustices but do not in any way address these microlevel everyday expressions of racism. For example, legal doctrine requires the demonstration of *intent* of racist action to litigate. However, this intent is often difficult to prove and racism is frequently built into the fabric of U.S. social structures and institutions such that a specific intent is not immediately apparent. From our perspective, legal doctrine has no precedent for addressing these forms of racism.

The second tenet assumes a critique of liberalism. According to Delgado and Stefancic (2000, 2001), liberals uphold the neutrality of the law and view it as objective and morally accurate. However, CRT questions these assumptions and the liberal notion of change in the law through the process of gradualism. As alluded to previously in this chapter, CRT draws on a term created by Derrick Bell, *interest convergence,* which describes a phenomenon in which Whites will only support Black advances if these advances serve White interests. Building on this concept, critical race theorists contend that the civil rights movement and the current legal structure do not foster structural change and that only through drastic alterations to systems, structures, and ideological foundations can true racial progress and equity ensue. These linkages are too infrequently considered both in the design and conduct of child and adolescent research, theory, and policy and in their interpretation in the social sciences.

Critical race theorists maintain that "structural determinism" in society impedes racial reform through a variety of means. Freeman argues that civil rights law enforces racial progress at a slow rate, creating a social control mechanism that insures enough change to prevent civil uprising while not actually altering the status quo (Delgado & Stefancic, 2001). The awareness of this may have implications for differences in cultural socialization practices, thus also an implication for youths' cultural identity formation, manifestations as part of reactive coping strategies for some, and implications for youths' degree of individual-contextual fit (e.g., see Swanson et al. 1998).

One of the tenets of CRT establishes that race is a product of social construction. Their analysis suggests that prevalent definitions and assumptions in society are never innocent of the inequities shaped by power relations. Youths' social-cognitive maturation makes the awareness of inequities difficult to articulate but remain unavoidably experienced as either a source of risk or a contributor of a protective factor. Thus, from a developmental perspective given maturing perceptions, CRT increases our understanding of youths' vulnerability level, coping processes, and stage-specific coping outcomes, given the several developmental tasks requiring mastery.

As an important conceptual contribution to child development scholarship, CRT acknowledges the importance of context and uses legal studies to further specify its impact. For example, the legal system functions based on the premises of generalizability and essentialized notions of right and wrong. These premises do not provide the legal space for consideration of the ways in which individuals are inequitably influenced and shaped

by their specific contextual factors. CRT uses the term *intersectionality* to acknowledge the complex, contradicting, and cumulative ways in which race, gender, class, and sexual orientation affect an individual's positioning in larger social structures. CRT contends that racism exists and continues in our society because the mind-set of the majority of people in the United States has not changed, despite the civil rights movement. This lack of change in mind-set introduces an entrenched conundrum: Although unacknowledged, its impact is inclusive of those individuals responsible for funding, designing, implementing, publishing, and interpreting social science research both for children of color and European American youth. Its use in the training of professionals and their modeling of the content (e.g., in youth and family service delivery and education practice) further contributes to its entrenched character, formidability, and persistence.

Encompassed under the umbrella of CRT are other subsidiary studies including critical White, Asian, and Latino studies and feminist and gay critical studies. Asian studies look critically at the *model minority stereotype,* while feminist and gay studies look at *intersectionality.* Critical White studies examine the ways in which Whiteness is *socially constructed* and how groups have historically moved in and out of this category. For example, certain ethnic populations in the United States such as Jews, Italians, and Irish have moved into the category of White, after being labeled as non-White during their early history in the United States. Such studies also explore the ways in which privileges associated with this label structure power relations and how discourse through literature and cultural forms powerfully reinforces stereotypes and the values associated with Whiteness in contrast to color (Delgado & Stefancic, 2001).

In sum, unlike the traditional approach to child developmental research, critical White studies contribute by affording an opportunity to deconstruct and specify the process of normal human development experienced in context for members of diverse groups. Roediger (2002) looks at the social construction of Whiteness and maintains that, historically, this category has been ignored. This continues to be the case particularly in the adolescent and child development literatures. Roediger cites Fusco who contends that to ignore this category tends to "redouble its hegemony by naturalizing it" (Roediger, 2001, p. 327), thus Whiteness becomes further ingrained as the normative standard. Roediger explores the historical process by which immigrants earned their status as White. The process of Americanizing European immigrants ("White ethnics") allowed them to be accepted as White rather than Irish or Polish. Underlying premises of CRT are instituted to critique the justice system, the educational system and policy affecting the broader society.

CRT has also been useful to analyze the implications of various educational legal reforms including integration and affirmative action (which affects a broad range of institutions including the educational system). Derrick Bell (2000b), in *Serving Two Masters,* looks at the outcomes of integration mandates and asks an important question: Is racial balance in the schools enough to provide educational equity? Bell contends that historically, since the 1930s, the approach of the National Association for the Advancement of Colored People (NAACP) has been to eliminate racial segregation across society. This approach took precedence in the education system, particularly, with the passing of *Brown* in 1954. The subsequent lack of compliance with the legal precedent set by *Brown* led to a series of school litigation cases being filed. For some theorists, the lack of compliance has not been unexpected and, again, reaffirms the salience of history for contemporary and entrenched practices.

W. E. B. Du Bois named the educational dilemma for our society in 1935 and his concerns remain prevalent even today and, although infrequently acknowledged, are particularly relevant in the field of child development. Integration has not proved to be the silver bullet for educational equity in our society, as predicted by Du Bois, and more comprehensive changes need to be made in society before educational equity can be a reality. Du Bois states:

> [T]he Negro needs neither segregated schools nor mixed schools. What he needs is Education. What he must remember is that there is no magic, either in mixed schools or segregated schools. A mixed school with poor and unsympathetic teachers, with hostile public opinion, and no teaching of truth concerning black folk, is bad. A segregated school with ignorant placeholders, inadequate equipment, poor salaries, and wretched housing is equally bad. Other things being equal, the mixed school is the broader, more natural basis for the education of all youth. It gives wider contacts; it inspires greater self-confidence; and suppresses the inferiority complex. But other things seldom are equal, and in that case, Sympathy, Knowledge,

> and the Truth, outweigh all that the mixed school can offer. (Bell, 2000b, p. 243)

Critiques of Critical Race Theory and Their Implications for Child Development Research. It is important to note that CRT has not been without its share of critiques. Delgado and Stefancic (2001) relay general critiques of the CRT approach, and some scholars in the broader discipline of legal studies have critiqued the CRT's use of storytelling in the law. Their critique rests on several premises, which are not unlike the standard research tensions between the use of quantitative versus qualitative research approaches in child development research: (a) These stories may not represent the typical experience of members of the larger group of individuals of color, (b) narratives lack analytical rigor, and (c) stories told by individuals of color stifle wider discussion due to the general belief that these individuals have a superior understanding of race. Some scholars critique the perspective held by critical race theorists that truth is a social construct created to further the position of those in power.

Another critique of CRT is that it focuses on changing discourse and cultural forms of racism and does not speak to the deeply ingrained structural/material racism, more strongly affecting the poor. This critique maintains that CRT focuses primarily on issues of identity and does not incorporate a thorough enough class analysis. Even in the discipline of CRT, theorists voice a need to develop further theories that look at the intersection between race and class. Also, critical race theorists express the need to develop a broader global analysis of race, looking at the connections of sweatshop concerns—the oppression of people of color abroad working low-wage jobs—and the unemployment of people of color in the United States (Delgado & Stefancic, 2001).

When considered together, Whiteness studies delineating the impact of racism and privilege along with CRT increase our understanding of proximal processes experienced by America's diverse youth post-*Brown*. Unfortunately, the links are seldom acknowledged and the oversight has important implications for the continuing dissemination of stigma and unquestioned assumptions concerning privilege. As elaborated, there are few demonstrations of the interaction of these themes than in the acting White myth associated with African American youth achievement and coping patterns (see Spencer, Cross, et al., 2003, pp. 276–287).

AN EXAMPLE OF AFRICAN AMERICANS AND THE ACHIEVEMENT GAP: AN INTERFACE OF STIGMATIZING CONTEXT, REACTIVE COPING RESPONSES, AND THE "ACTING WHITE" MYTH

In their analysis and critique of the acting White myth, Spencer and Harpalani (under review) describe Fordham and Ogbu's (1986) position that one of the main reasons that Black students do so poorly in school is that "they experience inordinate ambivalence and affective dissonance in regard to academic efforts and success" (Fordham & Ogbu, 1986, p. 177). Fordham and Ogbu further state that the cultural orientation in the Black community is that learning is equated to "acting White." Although roundly critiqued by Bronfenbrenner (1985), their three-group classification describes "autonomous" minorities as those who are minorities primarily in the numerical sense, "immigrant" minorities as those who arrived voluntarily with hopes of improving their lives, and "castelike," or involuntary minorities (e.g., Blacks, Native Americans, and Chicanos) as those who came to America involuntarily through slavery or conquest (Fordham & Ogbu, 1986; Ogbu, 1986).

Focusing on the castelike group, specifically Blacks, they purport to examine the expressive dimension of the relationship between minorities and the dominant culture. In exploring the African American and European American relationship, they focus on twin phenomena: oppositional cultural identity and oppositional frame of reference (Ogbu, 1990). Their analysis concludes that African Americans develop a sense of identity in opposition to the social identity of Whites due to their treatment in both the political and economic domains. Fordham and Ogbu's (1986) analysis suggests that an oppositional frame of reference is used as a protective device as a strategy to promote Black identity and foster the maintenance of Black/White cultural boundaries, thus development of protective devices is aimed at promoting Black identity. They posit that the setting and maintenance of boundaries reinforces solidarity and unity, suggesting that slavery reinforced this tendency through the creation of traditions such as beliefs concerning duty-bound relationships that extended beyond family relations (e.g., fictive kin networks).

They suggest an emphasis on group loyalty in situations involving conflict and competition with the majority group. Fordham and Ogbu (1986) suggest that these ideas influence children's perception of their potential

for success (see also Fordham, 1988, 1996). As analyzed by Spencer, Cross, et al. (2003), Fordham and Ogbu's contention is that, accordingly, Black students, especially adolescents, attending both integrated and predominantly Black schools face the burden of acting White. This line of reasoning suggests that Black youths' academic prowess and success are controlled by external and within-group factors. Thus, according to Fordham and Ogbu, "Apparently, Black children's general perception that academic pursuit is 'acting White' is learned in the Black community. The ideology of the community in regard to the cultural meaning of schooling is, therefore, implicated and needs to be reexamined" (p. 203). Overall, Fordham and Ogbu conclude that Blacks have not historically valued education and define academic achievement as a White cultural attribute. There is major shortsightedness in the conceptualization of this work, which is consistent with the flaws noted initially concerning the need for new theory. The first flaw is the absence of historical accuracy.

Historical Overview of African American Achievement Motivation

It is commonly assumed that slavery made achievement motivation impossible. As described, critiqued, and analyzed by Spencer, Cross, et al. (2003), the view suggests that from slavery forward, Blacks struggled not only with external sources of oppression but also with the effects of slavery, such as family dysfunctionality, psychological hatred, high rates of criminality, and low achievement motivation: the pattern is inferred by some to indicate a "mark of oppression" (see Kardiner & Ovesey, 1951, as the classic illustration of the deficit assumption). However, historical evidence traces the evolution of Black achievement motivation. The record shows that from the end of slavery and well into the twentieth century, Blacks, as individuals and as a social group, evidenced high achievement motivation, and we are hard-pressed to think of any White ethnic group, including Eastern European Jews, who evidenced a higher regard for achievement motivation for the period from the end of the Civil War to the early 1930s. The insufficiency of efforts to translate such high achievement motivation into social mobility was not linked to the legacy of slavery but to the larger society's failure to cultivate, compliment, reinforce, and authenticate the numerous manifestations of Black achievement motivation.

At the start of the twentieth century, Carter G. Woodson was surprised at the copious evidence concerning Black education (Woodson, 1919) that resulted in his 454 page scholarly text. In thinking about freedom for slaves, in a theoretical sense, certain owners became curious as to whether emancipated Blacks could handle freedom and the level of education demanded by the status as a free person; consequently, certain individual slaves were turned into test cases. Bullock (1967) describes how John Chavis of North Carolina was selected as an experimental case and sent to Princeton. Chavis not only passed his tests with flying colors but also returned to North Carolina to become a leading teacher for the children of the planter class. Both Bullock (1967) and Woodson (1919) underscore that the atmosphere of the revolutionary period stimulated a certain degree of leniency concerning the formal education of Blacks, and the curiosities and whims of the planters resulted in highly educated slaves. A few became part of the popular culture of the times, including Phyllis Wheatley, the Black poet, and Benjamin Banneker, the Black mathematician and author of the first Farmer's Almanac ever written in the United States. It is during the revolutionary period that the manumission of individual slaves helped produce large clusters of free Blacks in Atlanta, Charleston, and other major cities across the South; and as these clusters of free Blacks formed communities, the development of formal educational structures became an immediate enterprise.

Another ripple effect was the birth of the abolitionist movement. White leaders of this movement took the likes of Frederick Douglass, assisted in his formal education, and turned him loose, as an icon for their movement. Beyond assisting individuals, the movement helped found colleges where scores of Blacks could obtain a higher education. For those Whites who could not fathom a nation that included Blacks, but whose moral compass required that Blacks be educated, manumitted, and, then, sent back to Africa (colonization), also created educational opportunities for Blacks, including the construction of schools.

Black Response to Freedom: A Social Movement for Education

As delineated by Spencer, Cross, et al. (2003) as a historical overview, the Black community enjoyed a critical mass of educated leaders, teachers, and potential educational administrators. Du Bois estimated that 150,000 of

the 4 million slaves were able to read and write, and literacy was commonplace among free Blacks (Du Bois, 1935; p. 638). Thus, the source of the social movement suggests ex-slaves themselves because they seemed to carry educational designs in their ragged pockets as they crossed over into freedom. After the Civil War, educated Blacks and their White allies were dumfounded and even mildly shocked at the level of educational demands the ex-slaves immediately made on themselves and their leaders (Anderson, 1988): "A teacher at Port Royal declared that he could not set forth, in anything like adequate terms, the eagerness and determination with which the Black freedmen apply themselves, young and old, to the task of learning the alphabet [Another teacher was greeted by] a motley assemblage [who were] cold, dirty and half naked but eager to learn; [she found them less concerned with food and clothing] but anxious to feel sure that they would have the privilege of coming to school everyday" (Butchart, 1980, p. 169). Available research reported by Spencer, Cross, et al. (2003) indicate that the hunger for education came not simply from the eyes of children as "many teachers conducted night school as well as day schools to accommodate the aspirations of [adult] workers" (Butchart, 1980; p. 170). In sum, the drive for Black education was organic: It came from the ex-slaves themselves.

Just after the Civil War, John W. Alvord was appointed the national superintendent of schools for the Freedman's Bureau, and in 1866 he reported that Black-controlled schools numbered 500 and were to be found all over the South. Just 3 years later, in 1869, Black schools, now often associated with evolving Black churches, totaled 1,512, with 6,146 teachers and 107,109 pupils. The demand for education and the desire to be taught by Black teachers quickly strained the teaching force that first greeted the ex-slaves and their children. To meet the demands being made by the ex-slaves, educated Blacks, Northern societies, and the federal government helped to launch such new entities as Howard University and other Black colleges (Anderson, 1988; Bullock, 1967; Du Bois, 1935). Spencer, Cross, et al. (2003) suggest that the drive toward Black education, after the Civil War, can only be given its due if framed as a social movement—not a trend, not a drift, and not a contrivance imposed by White allies from the North. While educated free Blacks and White allies where crucial elements, the sheer scope of the educational demands and depth of ex-slaves revealed a deep seated *achievement motivation* that had its origins in slavery itself. As Anderson noted, "[B]lacks emerged from slavery with a strong belief in the desirability of learning to read and write. This belief was expressed in the pride with which they talked of the other ex-slaves who learned to read or write in slavery and in the esteem in which they held literate Blacks. It was expressed in the intensity and frequency of their anger at slavery for keeping them illiterate" (Anderson, 1988; p. 5).

W. E. B. Du Bois noted that the ex-slaves' immediate drive for education was one of the most amazing stories in the annals of Western history and culture (Du Bois, 1935). Had this drive and achievement motivation been positively received, cultivated, protected, and sustained by the larger society, within 100 years Blacks would have outstripped the social mobility patterns of all groups in modern American society, including Eastern European Jews. As noted by Spencer, Cross, et al. (2003), one is hard-pressed to think of any White ethnic group who entered the United States at the turn of the twentieth century with a collective achievement motivation that could match that exhibited by the ex-slaves on the heels of the Civil War. They suggest that those who would try to draw a straight line connecting contemporary problems in Black education with the legacy of slavery, such as Fordham and Ogbu (1986), are ignorant of this resilient history.

Reconstruction did not bring the ex-slaves land redistribution, education, protection, liberty, the right to vote, or social justice. During the bleak period between 1900 to 1930, historians have recorded that Blacks would often double and triple tax themselves to build and sustain schools, despite not receiving a fair share of tax dollars already paid.

In effect, Black citizens of Mississippi, Georgia, North Carolina and South Carolina, and other southern states reached deep into their grinding poverty and found the wherewithal—the achievement motivation—which propelled them to support the education of their children. History does not support Fordham and Ogbu's (1986) contention that Black communities have not valued education and that this devaluation is a reaction to White racism. The assumptions of Fordham and Ogbu (1986) are woefully negligent of the resilience that many African Americans displayed in the face of virulent institutionalized oppression. Their shortsighted perspectives have contributed to what Claude Steele (2004) refers to as social and identity contingencies that

reinforce social stigma and dissonance in the individual-context match.

Developmental Considerations for Research on Black Academic Achievement

As analyzed by Spencer, Cross, et al. (2003), in addition to neglecting the resilient history of Black achievement motivation, the acting White myth also makes large conceptual errors in its analysis of racial identity and cultural influences on human development. For example, the acting White hypothesis can be criticized on several grounds. It draws psychological inferences from sociohistorical data (Trueba, 1988), neglects within-group variation, and fails to understand and capture the psychological and developmental processes that lead to academic achievement and other outcomes. As noted by Obidah (2001), Ogbu (1990) does not account for variation in the so-called involuntary or castelike minorities and fails to note that some members of the majority group demonstrate characteristics he associates with involuntary minorities (MacLeod, 1987). Further, when considering Bronfenbrenner's (1989) ecological systems theory, it is apparent that Ogbu (1987; Fordham & Ogbu, 1986) limits much of his analysis at the level of the macrosystem, narrowly focusing on the social and historical conditions impacting African American academic achievement. He neglects the micro- and mesosystems, thereby failing to understand how these larger conditions play out in everyday lives. The previous section that reviewed the history of Black achievement motivation illustrates well how Ogbu's macrolevel analysis falls short in its inferences about the attitudes and motivation of African Americans toward education.

Further, as reported by Spencer, Cross, et al. (2003), Ford, Harris, Webb, and Jones (1994) note that Fordham (1988) neglects the phenomenon of "code switching"—demonstrating different modes of cultural communication and style in different settings—and that Black students can become bicultural rather than "raceless" and maintain their ethnic identities. Bicultural identity is one of the different modes of the Internalization stage that Cross (1995) has described in his model. It also represents a particular emergent identity in the PVEST framework, one that is not represented in Fordham's (1988, 1996) or Fordham and Ogbu's (1986) work. Other coping options also sensitive to diverse youth more generally are described by Datnow and Cooper (1996), which illustrate adaptive coping in the school context and show how peers of the same race in different contexts interpret the same phenomena differently. As noted earlier, such within-group variation is also largely neglected by Fordham and Ogbu (1986).

In a study of 562 Black adolescents, aged 11 to 16 from a southeastern U.S. city, Spencer, Noll, Stolzfus, and Harpalani (2001) found that individuals with a Eurocentric orientation, as indicated by a high score in Cross's (1971, 1991) Pre-Encounter stage, exhibit lower academic achievement and lower self-esteem than those individuals who have a proactive Afrocentric orientation—the Internalization stage. While individuals with a reactive Afrocentric orientation (Immersion-Emersion stage) performed poorly, the study indicates that a strong, proactive sense of Black cultural identity is associated with positive academic achievement for Black youth. The study by Spencer et al. (2001) illustrates the importance of considering both adaptive and maladaptive coping outcomes and shows how Black racial identity can be related to both. It also contradicts the claims of Fordham and Ogbu (1986) and Fordham (1988, 1996), who contend that Blacks must distance themselves from Black culture to achieve. As reviewed by Spencer, Cross, et al. (2003), it is interesting to note that Fordham and Ogbu's (1986) paper was not the first academic article to use the phrase "acting White." The earliest reference we found was a 1970 article by McArdle and Young entitled "Classroom Discussion of Racial Identity or How Can We Make It Without 'Acting White?'" The very question posed by McArdle and Young (1970) implies that it is possible to make it without acting White, an idea denied by Fordham (1988) and Fordham and Ogbu (1986).

Adolescents of all ethnicities engage in identity searching and strive for acceptance and approval. Cross's (1971; Cross et al., 1991) Immersion-Emersion identity stage may be characterized by anti-White attitudes. While this can be maladaptive, it is not an abnormal initial reaction to devaluation, particularly at this salient developmental period. If Black youth perceive a classroom, school, or other setting as a context where they are devalued, they may cope by defining the expectations of this context as acting White. However, this is reflective of normative identity development processes rather than a cultural devaluation of education. As Spencer et al. (2001) note, "acting White has so many potential variations based on multiple contextual

realities" (p. 28). The acting White phenomenon is not responsible for Black academic underachievement, nor is it reflective of a broad cultural frame of reference, as Fordham and Ogbu (1986) suggest. It is simply one of many coping responses to feeling devalued. Curiously, and acknowledged by Ogbu (1985), when describing high academically performing, first-generation South Asian immigrants, this high achievement has never been described as acting White. As noted by Trueba (1988), culturally based assumptions that represent sociohistorical assumptions are at best troubling. At worst, they serve as an additional source of stress and challenge to Black academic achievement and youths' effectance motivation.

As reviewed by Harpalani and Spencer (2005), irrespective of whether racism functions as product of economic relations, sociological relations, or as a consequence of some configuration between the social and economic race is defined by Omi and Winant (2002) as a "concept which signifies and symbolizes social conflicts and interests by referring to different types of bodies" (p. 123). Stoler (2002) complicates this notion of race by contending that there is a historical divergence between racism as overt, biologically based, and psychologically based and the new racism as insidious, cultural, and complex. There is a historical divergence in capturing racism as a difference between the seen and the unseen, on noticeable differences or on more subtle cultural differences. The selection of biological traits and/or cultural qualities for classification is a social and historical process, not rooted as a biological given. Over time, different groups of individuals have moved in and out of racial categories as economic and social conditions have changed. Hence, one can locate a plurality of racisms constructed as a result of the complex relationship between specific social, cultural, and economic factors (Hall, 2002; Omi & Winant, 2002; Stoler, 2002). Omi and Winant (2002) characterize "racial formation" as the "sociohistorical process by which racial categories are created, inhabited, transformed and destroyed" (p. 124).

Another historical way of categorizing racisms is articulated by Omi and Winant (2002) who explain the ways in which definitions and understandings have become more complex only recently. They contend that racism, before the 1960s, was understood using a rather limited lens—expressed through interpersonal relations and extending from individual prejudices. During the 1960s, our understanding of racism expanded to explore broader forms of discrimination and the ways in which racism is institutionally sanctioned and produced through structural inequities.

Essed (2002) develops an understanding of racism that synthesizes the ways in which microaggression works in conjunction with and through systemic inequities. Essed defines "everyday racism" as:

> a process in which (1) socialized racist notions are integrated into meanings that make practices immediately definable and manageable, (2) practices with racist implications become in themselves familiar and repetitive, and (3) underlying racial and ethnic relations are actualized and reinforced through these routine or familiar practices in everyday situations. (p. 190)

Furthermore, everyday racism is not necessarily communicated through direct interactions with people of color. For example, journalists produce their everyday products that perpetuate racist discourse and policymakers produce programs that can inadvertently perpetuate inequities. Essed maintains that "when racist notions and actions infiltrate everyday life and become part of the reproduction of the system, the system reproduces everyday racism" (2002, p. 188). Hence, macro and micro forms of racism are extensions of one another as microaggressions while racists are not always founded by intentional prejudice.

Omi and Winant (2002) refer to a "common sense" understanding, which they contend is a normative system of ideas and practices—perpetuated through education, the media, policy, and so on. Similar to Essed's characterization of everyday racism, racial inequities are perpetuated through these commonsense ways of relating and being in such a way that they are more insidiously woven into the fabric of society rather than expressions of direct racial prejudice. However, the existence of this form of racism in society does not eliminate more direct forms of prejudice. Rather, Omi and Winant maintain that our understanding of racism has broadened such that we now understand it to exist in plural forms that function through diverse contexts and power dynamics.

It is through the development of this normative system that hegemony operates. Hegemony defines the ways in which relations of power frame the shape of racism. This form of racism, as discussed previously in this review, is related to the historical and temporal context. This context is also shaped through power relations, and the form of racial inequity is molded through the

ways in which hegemony functions through coercion and particularly, through consent. Omi and Winant (2002) argue that as racial rule transitions in many societies from dictatorship to democracy, rule is based more directly on processes of consent rather than coercion, and beliefs concerning racial superiority and inferiority are a part of the discourse.

Cornel West (2002) has sought to locate the foundation of the idea of Black racial inferiority in Western culture. His efforts include an attempt to characterize the genealogy of modern racism, looking specifically at the cultural discourse. He makes links between the discourse associated with modernity and the ways in which White supremacy became substantiated as a dominant discourse. West contends that modern discourse of the late-seventeenth and eighteenth centuries in Western Europe and during the Enlightenment was structured such that the discourse of Black beauty and intelligence as equivalent to White standards was silenced. The modernity discourse of science and rationality fostered the observation, comparison, ranking, and ordering of physical characteristics of human bodies. The intellectual ordering and co-option of classical norms of beauty and culture made the equality of Black beauty and intelligence not only unreasonable but also barbaric. West (2002) argues that White supremacy is connected not only to economic relations and psychological needs of the White ruling class but also to the ways in which discourse is structured. Only certain notions of race are conceivable based on the structuring of the dominant modern discourse.

Goldberg (2002) complicates West's analysis through linking historical conceptions of moral subjectivity, the creation of racial exclusion, and modernity. He maintains that only in the second half of the twentieth century has the concept of rights been claimed as "vested and borne by the subject" (p. 298). This conception of rights has fueled the critical attack on racial discourse. However, Goldberg cites MacIntyre's characterization of "rights as a moral fiction," which claims to rest justifications on objective notions of morality but in actuality the moral order is based on subjective standards that shift over time and space. Goldberg points out the subjectivity of the moral order and how historically, morality has been used in diverse ways to both justify and critique the racial order. Moral categories are derived from the social structure and moral construction discourages *certain racist expressions while failing to recognize and discourage other forms.* Goldberg (2002) contends: "The rights others as a matter of course enjoy are yet denied people of color because black, *Brown,* red and yellow subjectivities continue to be disvalued; and the devaluation of these subjectivities delimits at least the applicability of rights or restricts their scope of application that people of color might otherwise properly claim" (p. 299). Thus, the progressive subtlety and subjective character of racial beliefs and their impacts concerning perceived inferiority and superiority of particular societal members is not independent of developmental factors. According, as a final theme and as reviewed by Harpalani and Spencer (2005), when considered especially for children and adolescents, it is important to detail the impact of denied rights as subjectively experienced in the course of human development.

RACISM AND HUMAN DEVELOPMENT

As described elsewhere (see Harpalani & Spencer, 2005) and inferred from the integration and analysis presented, racism is an insidious and omnipresent phenomenon that is translated through multiple levels of social, cultural, and historical contexts and affects a large impact on human lives. The traditional definition of racism as simply discrimination based on race does not cover the vast range of ways in which this phenomenon is manifested. As experienced by youth, racism is signified not only by discriminatory behavior but also by structural relationships, political ideologies, and institutional practices, all of which are often viewed as normative components of our society and a critical aspect of every day life for all. These structural and ideological components are highly institutionalized, thus affecting individual experiences and life trajectories, not only by disadvantaging people of color but also by privileging White people. To help understand how racism operates, we integrate various theoretical traditions here, examining social, political, and cultural forces that shape history and society and the ways in which these forces impact individuals' identities and everyday lives.

Classical opinions about racism, while acknowledging its damaging impact, tended to view this phenomenon as a set of aberrant attitudes and behaviors resulting from mistaken beliefs or *mis*education. Newer theories have critiqued this approach and provided a broader, systemic delineation of racial hierarchy in

societies. To understand the salience of racism for human development and life-stage specific outcomes, it is first necessary to examine its broad, systemic character. However, a societal approach to racism by itself is not sufficient for developmental science; it is also necessary to examine the different ways that youth cope with experiences of racism that present many challenges for youth of color and unrecognized privileges for White youth. To accomplish this end, both sociological theories of racism and contextually sensitive frameworks for human development are useful, and these can be integrated to understand how systemic racism impacts the lives of youth.

Among the most widely cited works on the sociohistorical formation of racism is Omi and Winant's (1994) treatise, *Racial Formation in the United States.* This text outlines the various paradigms that sociologists in the twentieth century have employed to understand race and racism. The authors highlight the social construction of race: Racial groups do not reflect discrete biological categories, but are social and political divisions based on superficial physical features—divisions that are created primarily for the purpose of economic and political subordination (i.e., racism). Omi and Winant (1994) note that in sociological theorizing, analyses of race and racism have often been subsumed under other paradigms, including *ethnicity* (with an emphasis on culture and assimilation processes), *class* (with a Marxist orientation underscoring economic and labor divisions), and *nation* (with a focus on anti-colonial struggles and collective consciousness formed in response to these struggles). Omi and Winant's (1994) perspective centers on *racial formation,* which they define as, "the sociohistorical process by which racial categories are created, inhabited, transformed, and destroyed" (p. 55). Racial formation emphasizes the intersection of various influences in this process of racialization and recognizes racial formation as a phenomenon that occurs at multiple levels, with macrolevel structural manifestations that translate into individual everyday experiences at the microlevel. Omi and Winant (1994) discuss racial formation in terms of "historically situated, racial projects," which are posited interpretations and explanations of the racial dynamics in a society and serve to reallocate resources to various racial groups. Racism is constituted by those racial projects that "create or reproduce structures of domination based on essentialist categories of race" (p. 194).

Building on Omi and Winant's (1994) ideological notions of racial formation, Bonilla-Silva (2001) outlines a theory of racism that is both structural and process-oriented: the *racialized social systems* framework. In this framework, racialized social systems are societies that allocate material and social rewards differentially by race, and such societies develop a particular *racial structure:* the set of social relations, cultural practices, and tacit and explicit assumptions, based on physical distinctions that govern the social construction of racial groups in the society.

Inclusive theories of human development, in conjunction with systemic analyses of racism often found in CRT, can help elucidate how racism impacts developmental outcomes. For example, Bronfenbrenner's (1989) ecological systems theory provides an effective framework to analyze the role of social, cultural, and historical context in human development, and thus to illustrate the impact of racism at multiple levels. As reviewed by Harpalani and Spencer (2005), in its role as a process oriented theoretical tool, ecological systems theory offers mediating points between larger structural processes and the immediate settings where racism is encountered in everyday life. A final step for developmental scientists interested in the effects of racism is to employ an identity-focused, contextually sensitive, theory of human development that can illustrate how bias (e.g., racism) impacts experiences, coping, identity formation, and outcomes from a developmental perspective—through all stages of the life course. We posit that PVEST (Spencer, 1995) provides such a framework (see Figure 15.12).

As suggested, PVEST links context and experience with individual meaning-making and identity formation, all from the perspective of human development. While ecological systems theory provides a *means for describing hierarchical levels of context,* PVEST directly illustrates life-course human development as influenced by these multiple levels of context. PVEST serves as a model to examine normative developmental processes—framed through the interaction of identity, lived cultural experiences, and tangible manifestations of racism, including White privilege, for youth of all ethnicities. In doing so, it takes into account individual differences in experience, perception, and negotiations of stress and dissonance. PVEST demonstrates a recycling through the life span, as individuals encounter new risks and protective factors, experience new stressors (potentially

offset by supports), establish more expansive coping strategies, and redefine how they view themselves, which also impacts how others view them. Thus, as elaborated in Harpalani and Spencer (2005), PVEST is a temporally contingent model; it illustrates how outcomes in prior stages impact developmental challenges that individuals encounter and resolve in current situations. Many researchers have examined the relationship of systemic racism to outcomes; however, PVEST highlights the mediating processes between race, as a risk factor, and tangible outcomes. As suggested by Figure 15.20, essentially, it allows us to examine "how" different individuals cope with racism throughout their life-course development.

Future research on racism, along with social, political, and legal attempts to mitigate its impact, should take into account both the subtle, normative expressions of this phenomenon and the different levels at which it is manifested. Individual level interventions are necessary, but transformation of institutions and their practices will also be vital in the long run. The theories noted along with many others, afford varying insights on the nature of racism and its broad impacts on human lives. Developmental scientists have the option to draw on these frameworks in the production of better science, which allows all youth, regardless of race, to achieve their full potential.

In summary, it is apparent that the several themes pursued have important implications for the content of the invariable linear or deterministic thinking that continues to serve as shorthand analyses of youths' life-course coping efforts. Accordingly, it is obvious that context, cultural traditions and normative human developmental processes matter and interact while humans transition across time and place. Utilizing PVEST as an organizing framework, this final section provides helpful heuristic devices for inferring more sensitive and valid conclusions about expected outcomes. The strategy should diminish the dissemination of stigma and stereotypes in the conduct of developmental science: Interpretive frameworks representing models, which afford best inferences concerning *both dual* aspects *implicit in* youths' Net Vulnerability (i.e., levels of risks ***and*** protective factors)—*given the experience of net stress and coping processes*—that may be anticipated for a particular *stage-specific coping outcomes* (i.e., unproductive versus productive options).

CONCLUSIONS AND PHENOMENOLOGICAL VARIANT OF ECOLOGICAL SYSTEMS THEORY INFLUENCED INTERPRETATIONS OF YOUTHS' STAGE-SPECIFIC COPING OUTCOMES AS A FUNCTION OF NET VULNERABILITY

One major certainty to be concluded from the multidisciplinary literatures integrated and analyses provided in demonstrating the benefits of PVEST is that any *inclusive theory of human development* should bear a particular burden. Specifically, *not only* should the framework acknowledge and incorporate the major objectively identifiable expressions of human variation (e.g., race, gender, and unique life-course placement—an infant versus an elder) that may differentially interface with context, *but also* provide an adequate explanation of the "how" of human development processes that leads to the "what" or particularly patterned outcomes (see Figure 15.20).

The uniquely structured and experienced processes of human development are inextricably linked to the tensions produced between nuanced developmental tasks pursued by the individual given context character and influences of the psychohistorical moment, along with expectations for competence. However, unavoidable tensions are also produced as a function of children's characteristics such as group membership and context quality; although infrequently noted, the latter continues to be linked to structural conditions associated with race, racism, and White privilege. As indicated in the synthesis statement, this unchanging dilemma is overlooked in the child psychology literature except for a priori assumptions of deviance, psychopathology, or problems associated with youth of color. Further, this situation, experienced as stigmatization, is linked to historical conditions and includes their perpetuation as values, beliefs, attitudes, contextual inequalities, and psychosocial experiences. Considered together, they serve neither to perpetuate risks nor to promulgate protective factors as net stress is experienced, reactive coping responses evoked, and emergent identities enacted. Thus, recursively structured, they become associated with particular stage-specific outcomes as young lives unfold given particular cultural traditions. Accordingly, our introduction of PVEST as an ICE perspective suggests that the unfolding coping processes and consequent coping products experienced at one stage serves as the

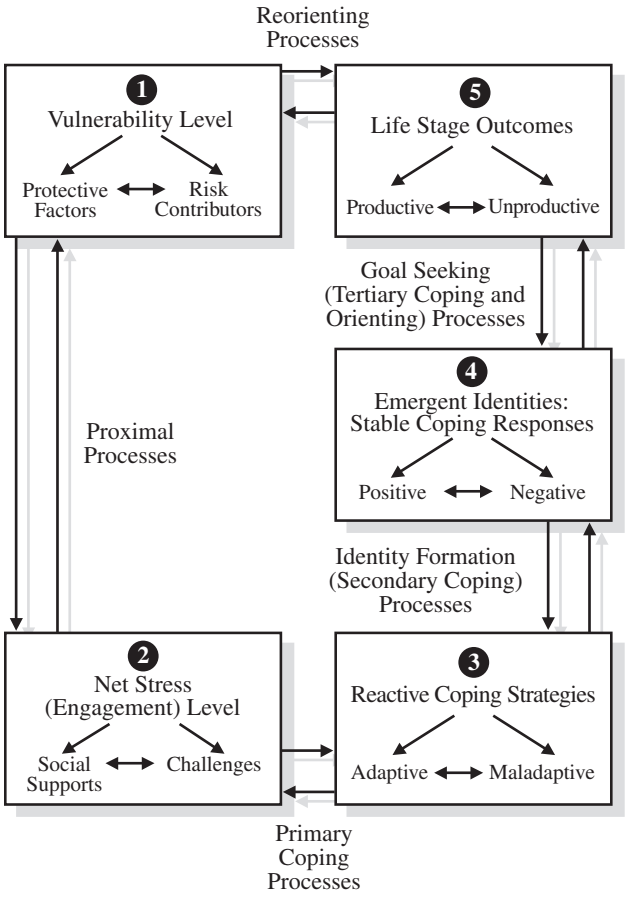


Figure 15.20 Processes Emphasizing Phenomenological Variant of Ecological Systems Theory (PVEST). *Source:* From Spencer & Harpalani, 2004.

major source of the individual's net vulnerability at the next stage given the ongoing experiences of individual-context interface. Thus, as a dynamic recursive theoretical framework, PVEST moves beyond narrow deterministic perspectives of human development.

Conceptual Advantages of Phenomenological Variant of Ecological Systems Theory as a Dual Axis Coping Outcome Interpretational Framework of Human Development: Traditional and Limited Dual Axis Perspectives

As illustrated in Figure 15.21, in general, traditional and limited views of human development may consider risk level and protective factor intensity for understanding human vulnerability. However, the approach is still generally underdeveloped when considering the experiences of diverse youth of color.

As suggested by the literatures reviewed and synthesized, high risk assessments without the consideration of available protective factors have generally represented the analyses of youth of color. At the same time, unacknowledged White privileging views about European Americans are generally not associated with estimates of vulnerability (i.e., only protective factors such as social class are considered). As suggested and more problematic, the high performance often associated with middle-income European Americans is assumed to be the expected norm for all youth; outliers are considered deviant or atypical. As illustrated, two groups are usually compared when conducting research with diverse youth; middle-income Whites are invariably compared with a group or groups of low-resource marginalized group youth. This lack of equivalent sample comparisons, as described in an early section of the paper, remains a significant problem in the developmental literature on child development. However, as illustrated in Figure 15.21 and when compared against Figure 15.22, there remain conceptual shortcomings and simplistic assumptions when dual analyses of vulnerability are provided.

As suggested, as a dual axis model of vulnerability, too frequently Quadrant I is assumed to be poor and mi-

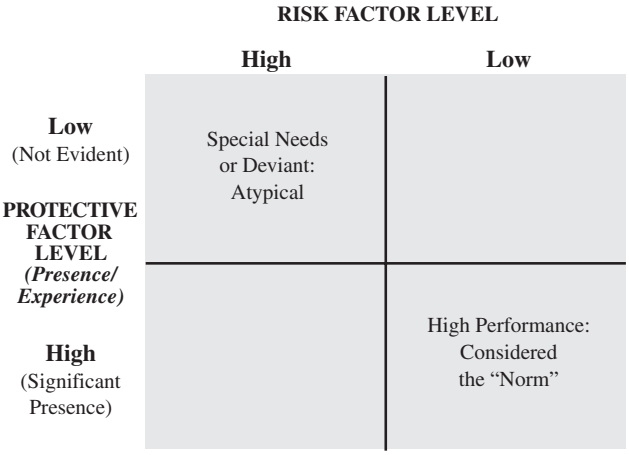


Figure 15.21 Traditional and limiting dual axis Perspective: This view narrowly compares extremes. *Source:* From "What Does 'Acting White' Actually Mean?: Racial Identity, Adolescent Development, and Academic Achievement among African American Youth," by M. B. Spencer and V. Harpalani, in *Minority Status, Collective Identity and Schooling,* J. U. Ogbu (Ed.), submitted, Mahwah, NJ: Erlbaum; Adapted from "Introduction: The Syndrome of the Psychologically Vulnerable Child" (pp. 3–10), by E. J. Anthony, in *The Child in His Family: Children at Psychiatric Risk,* E. J. Anthony and C. Koupernik (Eds.), 1974, New York: Wiley.

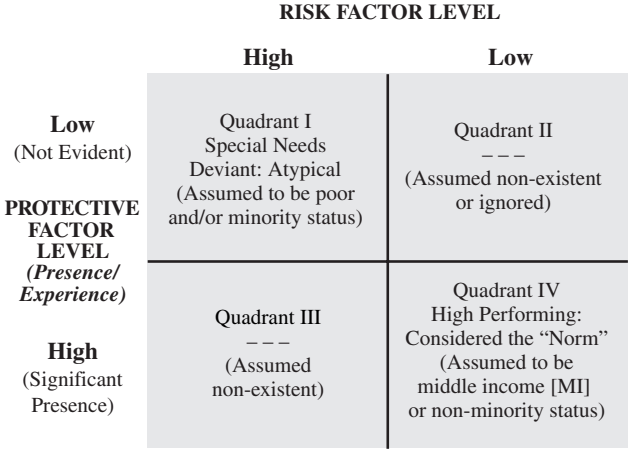


Figure 15.22 Shortcomings and assumptions of a traditional dual axis model. *Source:* Adapted from "Introduction: The Syndrome of the Psychologically Vulnerable Child" (pp. 3–10), by E. J. Anthony, in *The Child in His Family: Children at Psychiatric Risk,* E. J. Anthony and C. Koupernik (Eds.), 1974, New York: Wiley.

nority, on the one hand, and Quadrant IV is assumed to be youth of middle-income and nonminority (or model minority) status; on the other hand. Quadrant II is generally ignored in the literature except for recent efforts by Luthar (2003) with extremely affluent suburban European Americans. Alternatively, when considering Quadrant III, the major publication patterns in child psychology have overwhelmingly ignored this high risk and high protective factor level group or assumed that it does not exist. There are a few theorists that explore protective factors such as parental monitoring, cultural socialization, specific achievement enhancing programming, and reference group identity as protective factors (e.g., Spencer, 1983; Spencer, Fegley, & Harpalani, 2003; Spencer, Noll, et al., 2001; Swanson et al., 2002; Youngblood & Spencer, 2002). When considered together, it appears that as a specific outcome oriented perspective of the PVEST framework, Figure 15.23 provides important implications for interpreting resiliency particularly as conceptualized by Anthony (1987).

Predicting Positive Outcomes in the Face of Challenge

One of the many strengths of James Anthony's (1974) formulation of resiliency is its acknowledgment of the simultaneous interfacing of protective factors with risk. He defines resiliency as the attainment of positive outcomes in the face of risk. Inferred from his definition is that one can only be resilient given the presence of high risk and its net-balancing with protective factors. Thus, as described in Figure 15.23, lacking a high level of protective factors, Quadrant I youth can be labeled highly vulnerable; however, Quadrant II youth are low on risk factor level although generally lacking high levels of protective factors; accordingly, Figure 15.23 describes them as lacking in significant symptomatology but show overall "masked vulnerability."

As indicated, Quadrant IV youth are generally those who have high levels of protective factors and low or no discernible risks; problematically, they are often used as the standard or norm for all; however, as indicated, they are described as "untested" or actually possessing "undetermined vulnerability" as depicted in Figure 15.23 as the PVEST-linked vulnerability level and resiliency prediction dual axis coping outcome model. Considered carefully from the theoretical perspective of James Anthony, as a major contributor to the PVEST framework, "resiliency" can only be expected for Quadrant III Group because, as defined by Anthony, resiliency is associated with those experiencing significant levels of risk but concomitantly have access to high levels of protective factors. As indicated, we believe that this dual axis model provides a clarifying heuristic device for understanding levels of vulnerability and resiliency prediction estimates without engaging in unfair and stigmatizing analyses.

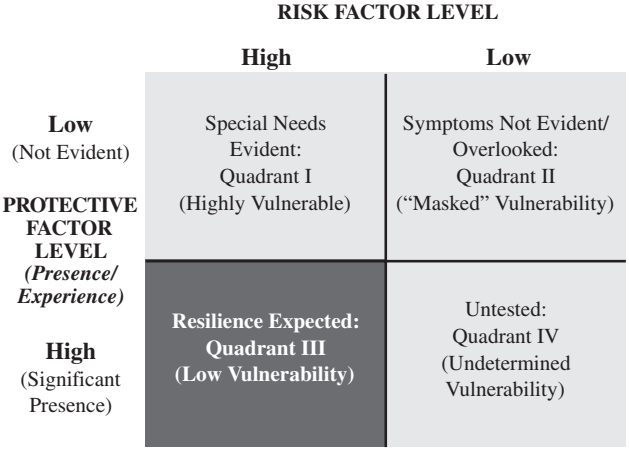


Figure 15.23 PVEST-linked vulnerability level and resiliency predicting dual axis coping outcome model. *Source:* Adapted from "Introduction: The Syndrome of the Psychologically Vulnerable Child" (pp. 3–10), by E. J. Anthony, in *The Child in His Family: Children at Psychiatric Risk,* E. J. Anthony and C. Koupernik (Eds.), 1974, New York: Wiley.

Unfortunately, this is not the orientation of most theories of human development that consider the experiences of diverse youth. Importantly, PVEST is not only applicable to identifiable diverse young people and sensitive to their unique cultural and contextual niches but also serves as a broad life-course theory of human development, which analyzes the systemic relationships between vulnerability, stress level, coping processes (i.e., reactive, stable coping as emergent identities), and stage-specific coping outcomes as lives unfolds across the life course irrespective of group membership (including privilege) and its socially structured social standing.

In sum, considered together, PVEST and its dual axis coping outcome model of human development provide conceptual tools and heuristic devices for accounting for the diverse expressions of human development in cultural context.

REFERENCES

Allen, W. R. (1985). Race, income and family dynamics: A study of adolescent male socialization processes and outcomes. In M. B. Spencer, G. K. Brookins, & W. R. Allen (Eds.), *Beginnings: The social and affective development of Black children* (pp. 273–292). Hillsdale, NJ: Erlbaum.

Allen, W. R., Spencer, M. B., & Brookins, G. K. (1985). Synthesis: Black children keep on growing. In M. B. Spencer, G. K. Brookins, & W. R. Allen (Eds.), *Beginnings: The social and affective development of Black children* (pp. 301–314). Hillsdale, NJ: Erlbaum.

Anderson, J. D. (1988). *The education of Blacks in the south, 1860–1935.* Chapel Hill: University of North Carolina Press.

Anthony, E. J. (1974). Introduction: The syndrome of the psychologically vulnerable child. In E. J. Anthony & C. Koupernik (Eds.), *The child in his family: Children at psychiatric risk* (pp. 3–10). New York: Wiley.

Anthony, E. J. (1987). Risk, vulnerability, and resilience: An overview. In E. J. Anthony & B. J. Cohler (Eds.), *The invulnerable child* (pp. 3–48). New York: Guilford Press.

Armour, J. D. (2000). Race *Ipsa Loquitur:* Of reasonable racists, intelligent bayesians, and involuntary negrophobes. In R. Delgardo & J. Stefancic (Eds.), *Critical race theory* (chap. 17). Philadelphia: Temple University Press.

Arrington, E. G. (2002). Negotiating race and racism: Black youth in racially dissonant schools. *Dissertation Abstracts International, 62,* 12. (UMI No. AA13031636)

Balkin, J. M. (2001). *What Brown versus Board of Education should have said.* New York: New York University Press.

Banks, W. C. (1976). White preference in Blacks: A paradigm in search of phenomenon. *Psychological Bulletin, 83,* 1179–1186.

Barker, R. G., & Wright, H. F. (1949). Psychological ecology and the problem of psychosocial development. *Child Development, 20,* 131–143.

Barker, R. G., & Wright, H. F. (1954). *Midwest and its children: The psychological ecology of an American town.* Evanston, IL: Row and Peterson.

Baron, H. (1971). The demand for Black labor: Historical notes on the political economy of racism. *Radical American, 5*(2), 1–46.

Bell, D. A. (1992). *Faces at the bottom of the well: The permanence of racism.* New York: Basic Books.

Bell, D. A. (1995). Brown v. Board of Education and the interest convergence dilemma. In K. Crenshaw, N. Gotanda, G. Peller, & K. Thomas (Eds.), *Critical race theory: The key writings that formed the movement* (pp. 20–28). New York: New Press.

Bell, D. A. (2000a). After we've gone: Prudent speculations on America in a post-racial epoch. In R. Delgado & J. Stefancic (Eds.), *Critical race theory: The cutting edge* (pp. 2–8). Philadelphia: Temple University Press.

Bell, D. A. (2000b). Serving two masters: Integration ideals and client interests in school desegregation litigation. In R. Delgado & J. Stefancic (Eds.), *Critical race theory: The cutting edge* (pp. 236–246). Philadelphia: Temple University Press.

Board of Education of Oklahoma City v. Dowell, 49.8 U.S. 237 (1991).

Bolling v. Sharpe, 347 U.S. 497 (1954).

Bonilla-Silva, E. (2001). *White supremacy and racism in the post-civil rights era.* Boulder, CO: Lynne Rienner Publishers.

Boyd-Franklin, N. (1989). *Black families in therapy: A multisystems approach.* New York: Guilford Press.

Boykin, A. W. (1986). The triple quandary and the schooling of Afro-American children. In U. Neisser (Ed.), *The school achievement of minority children* (pp. 57–92). Hillsdale, NJ: Erlbaum.

Boykin, A. W., & Ellison, C. M. (1995). The multiple ecologies of Black youth socialization: An afrographic analysis. In R. L. Taylor (Ed.), *African-American youth: Perspectives on their status in the United States* (pp. 93–128). Westport, CT: Praeger.

Boykin, A. W., & Toms, F. (1985). Black child socialization: A conceptual framework. In H. P. McAdoo & J. McAdoo (Eds.), *Black children: Social, educational, and parental environments* (pp. 33–52). Newbury Park, CA: Sage.

Bronfenbrenner, U. (1977). Toward an experimental ecology of human development. *American Psychologist, 32,* 513–531.

Bronfenbrenner, U. (1979). *The ecology of human development: Experiments by nature and design.* Cambridge, MA: Harvard University Press.

Bronfenbrenner, U. (1985). Summary. In M. B. Spencer, G. K. Brookins, & W. R. Allen (Eds.), *Beginnings: Social and affective development of Black children* (pp. 67–73). Hillsdale, NJ: Erlbaum.

Bronfenbrenner, U. (1989). Ecological systems theory. In R. I. Vasta (Ed.), *Annals of Child Development: Vol. 6. Six theories of child development* (pp. 187–249). Greenwich, CT: JAI Press.

Bronfenbrenner, U. (1992). *The process-person-context model in development research: Principles, applications and implications.* Unpublished manuscript, Cornell University, Department of Human Development and Family Studies, Ithaca, NY.

Bronfenbrenner, U. (1993). The ecology of cognitive development. In R. H. Wozniak & K. W. Fischer (Eds.), *Development in context: Acting and thinking is specific environments* (pp. 3–44). Hillsdale, NJ: Erlbaum.

Bronfenbrenner, U., & Ceci, S. J. (1993). Heredity, environment, and the question "How?": A first approximation. In R. Plomin & G. E.

McClearn (Eds.), *Nature, nurture, and psychology* (pp. 313–324). Washington, DC: American Psychological Association.

Bronfenbrenner, U., & Ceci, S. J. (1994). Nature-nurture reconceptualized in developmental perspective: A bioecological mode. *Psychological Review, 101*(4), 568–586.

Bronfenbrenner, U., & Crouter, A. C. (1983). The evolution of environmental models in developmental research. In P. H. Mussen (Series Ed.) & W. Kessen (Vol. Ed.), *Handbook of child psychology: Vol. I. History, theory, and methods* (pp. 357–414). New York: Wiley.

Brookins, G. K. (1985). Black children's sex role ideologies and occupational choices in families of employed mothers. In M. B. Spencer, G. K. Brookins, & W. R. Allen (Eds.), *Beginnings: Social and affective development of Black children* (pp. 257–272). Hillsdale, NJ: Erlbaum.

Brookins, G. K. (1988). Making the honor roll: A Black parent's perspective on private education. In D. T. Slaughter & D. J. Johnson (Eds.), *Visible now: Blacks in private school* (pp. 12–20). New York: Greenwood Press.

Brown I. 347 U.S. 483 (1954).

Brown II. 349 U.S. 294 (1955).

Bullock, H. A. (1967). *A history of Negro education in the south: From 1619–present.* Cambridge, MA: Harvard University Press.

Butchart, R. E. (1980). *Northern schools, southern Blacks, and reconstruction: Freedmen's education, 1862–1875.* Westport, CT: Greenwood Press.

Carroll, G. (1998). Mundane extreme environmental stress and African American families: A case for recognizing different realities. *Journal of Comparative Family Studies, 29*(2), 271–283.

Carroll, G., & Tyler, K. (under review). A portrait of African American suicide: An interaction of racism and stress.

Ceci, S. J. (1994). Cognitive and social factors in children's testimony. In B. D. Sales & G. R. VandenBos (Eds.), *Psychology in litigation and legislation* (pp. 11–54). Washington, DC: American Psychological Association.

Chestang, L. W. (1971). The dilemma of biracial adoptions. *Social Work, 17,* 100–105.

Chestang, L. W. (1972). *Character development in a hostile environment* (Occasional Paper, No. 3). Chicago: University of Chicago, School of Social Service Administration.

Clark, K. B., & Clark, M. P. (1939). The development of consciousness of self and the emergence of racial identity in Negro preschool children. *Journal of Social Psychology, 10,* 591–599.

Clark, K. B., & Clark, M. P. (1940). Skin color as a factor in racial identification of Negro preschool children. *Journal of Social Psychology, 2,* 159–169.

Cole, M. (1996). *Cultural psychology: A once and future discipline.* Cambridge, MA: Harvard University Press.

Crenshaw, K., Gotanda, N., Peller, G., & Thomas, K. (1995). *Critical race theory: Key writings that formed the movement.* New York: New Press.

Cross, W. E., Jr. (1971, July). The Negro-to-Black conversion experience. *Black World,* 13–27.

Cross, W. E., Jr. (1991). *Shades of Black: Diversity in African-American identity.* Philadelphia: Temple University Press.

Cross, W. E., Jr. (1995). The psychology of nigrescence. In J. Ponterotto, J. Casas, L. Suzuki, & C. Alexander (Eds.), *Handbook of counseling* (pp. 93–122). Thousand Oaks, CA: Sage.

Cross, W. E., Jr. (2001). Encountering nigrescence. In J. Ponterotto, J. M. Casas, L. A. Suzuki, & C. M. Alexander (Eds.), *Handbook of multicultural counseling* (pp. 30–44). Thousand Oaks, CA: Sage.

Cross, W. E., Jr., & Vandiver, B. J. (2001). Nigrescence theory and measurement. In J. G. Ponterotto, et al. (Eds.), *Handbook of multicultural counseling* (pp. 371–393). Thousand Oaks, CA: Sage.

Cunningham, M. (1993). Sex role influences of African American adolescent males: A literature review. *Journal of African American Male Studies, 1,* 30–37.

Cunningham, M., Swanson, D. P., Spencer, M. B., & Dupree, D. (2003). The association of physical maturation with family hassles in African American adolescent males. *Journal of Cultural Diversity and Ethnic Minority Psychology, 9,* 274–276.

Damon, W. (2002, February). *The development of purpose during adolescence.* Paper presented at the Fuller Thrive Author Conference for beyond the Self: Perspectives on Transcendence and Identity Development, Pasadena, CA.

Darity, W. A., Jr., & Myers, S. L., Jr. (1998). *Persistent disparity: Race and economic inequality in the United States since 1945.* Northampton, MA: E. Elgar.

Datnow, A., & Cooper, R. (1996). Peer networks of African-American students in independent schools: Affirming academic success and racial identity. *Journal of Negro Education, 65*(4), 56–72.

DeCharms, R. (1968). *Personal causation: The internal affective determinant of behavior.* New York: Academy Press.

Delgado, R., & Stefancic, J. (2000). Introduction. In R. Delgado & J. Stefancic (Eds.), *Critical race theory: The cutting edge* (pp. xv–xix). Philadelphia: Temple University Press.

Delgado, R., & Stefancic, J. (2001). *Critical race theory: An introduction.* New York: New York University Press.

Du Bois, W. E. B. (1903). *The souls of Black folk.* Greenwich, CT: Fawcett Publications.

Du Bois, W. E. B. (1935). *Black reconstruction.* New York: S. A. Russell.

Dupree, D., Spencer, M. B., & Bell, S. (1997). The ecology of African American child development: Normative and non-normative outcomes. In G. Johnson-Powell & Y. Yamamoto (Eds.), *Transcultural child psychiatry: A portrait of America's children* (pp. 237–268). New York: Wiley.

Dweck, C. S. (1978). Achievement. In M. Lamb (Ed.), *Social and personality development* (pp. 114–130). New York: Holt Reinhart.

Elder, G. H., Jr. (1974). *Children of the great depression.* Chicago: University of Chicago Press.

Eng, P. (1999). *Warrior lessons.* New York: Pocket Books.

Erikson, E. H. (1959). Identity and the life cycle. *Psychological Issues, 1,* 1–171.

Erikson, E. H. (1968). *Identity: Youth and crisis.* New York: Norton.

Essed, P. (2002). Everyday racism: A new approach to the study of racism. In P. Essed & D. T. Goldberg (Eds.), *Race critical theories: Test and context* (pp. 176–194). Malden, MA: Blackwell.

Fegley, S. G., Spencer, M. B., Gross, T. N., Harpalani, V., & Charles, N. (in press). Bodily self-awareness: Skin color and psychosocial well-being in adolescence. In W. Overton & U. Mueller (Eds.), *Body in mind, mind in body: Developmental perspectives on embodiment and consciousness.* Mahwah, NJ: LEA.

Fischbein, S. (1980). IQ and social class. *Intelligence, 4,* 51–63.

Fisher, C. B., Hoagwood, K., Boyce, C., Duster, T., Frank, D., Grisso, T., et al. (2002). Research ethics for mental health science involving ethnic minority children and youths. *American Psychologist, 57*(12), 1024–1040.

Flavell, J. H. (1968). *The development of role-taking and communication skills in children.* New York: Wiley.

Ford, D. Y., Harris, J. J., Webb, K. S., & Jones, D. L. (1994). Rejection or confirmation of racial identity: A dilemma for high-achieving Blacks? *Journal of Educational Thought, 28*(1), 7–33.

Fordham, S. (1988). Racelessness as a strategy in Black students' school success: Pragmatic strategy or pyrrhic victory? *Harvard Educational Review, 58*(1), 54–84.

Fordham, S. (1996). *Blacked out: Dilemmas of race, identity and success at Capital High*. Chicago: University of Chicago Press.

Fordham, S., & Ogbu, J. U. (1986). Black students' school success: Coping with the "burden of 'acting White.'" *Urban Review, 18,* 176–206.

Freeman, A. D. (1995). Legitimizing racial discrimination through antidiscrimination law: A critical review of Supreme Court doctrine. In. K. Crenshaw, N. Gotanda, G. Peller, & K. Thomas (Eds.), *Critical race theory: The key writings that formed the movement* (pp. 29–45). New York: New Press.

Freeman v. Pitts, 503 U.S. 467 (1992).

Frye, D. (1992). Causes and precursors of children's theories of mind. In D. Hay & A. Angold (Eds.), *Precursors and causes in development and psychopathology* (pp. 145–168). West Sussex, England: Wiley.

Frye, D., & Moore, C. (1991). *Children's theories of mind: Mental states and social understanding.* Hillsdale, NJ: Erlbaum.

Goldberg, D. T. (2001). *Race critical theories* (P. Essed & D. T. Goldbert, Eds.). Malden, MA: Blackwell.

Goldberg, D. T. (2002). Modernity, race, and morality. In P. Essed & D. T. Goldberg (Eds.), *Race critical theories: Text and context* (pp. 14–40). Malden, MA: Blackwell.

Gottlieb, G. (1995). Some conceptual deficiencies in "developmental" behavior genetics. *Human Development, 38,* 131–141.

Gump, P. V., & Sutton-Smith, B. (1955). The "It" in children's games. *Group, 17,* 3–8.

Guthrie, R. (1976). *Even the rat was White: A historical view of psychology.* New York: Harper & Row.

Hall, S. (2000). In R. Delgardo, & J. Stefancic (Eds.), *Critical race theory: An introduction.* Philadelphia: Temple University Press.

Hall, S. (2002). Race, articulation, and societies structured in dominance. In P. Essed & D.T. Goldberg (Eds.), *Race critical theories: Text and context (pp. 38–68).* Malden, MA: Blackwell.

Hare, B. R., & Castenell, L. A., Jr. (1985). No place to run, no place to hide: Comparative status and future prospects of Black boys. In M. B. Spencer, G. K Brookins, & W. R. Allen (Eds.), *Beginnings: The social and affective development of Black children* (pp. 201–214). Hillsdale, NJ: Erlbaum.

Harpalani, V. (1999). *A critique of Hoberman's Darwin's athletes: Invalid psychological inferences from a sociohistorical framework.* Unpublished manuscript, University of Pennsylvania, Philadelphia, Graduate School of Education.

Harpalani, V., & Spencer, M. B. (2005). Racism. In C. B. Fisher & R. M. Lerner (Eds.), *Applied developmental science: An encyclopedia of research, policies, and programs* (pp. 905–909). Thousand Oaks: Sage.

Havighurst, R. J. (1953). *Human development and education.* New York: McKay.

Hergenhahn, B. R., & Olson, M. H. (1993). *An introduction to theories of learning*. Englewood Cliffs, NJ: Prentice-Hall.

Hetherington, E. M., & Kelly, J. (2003). *For better or for worse: Divorce reconsidered.* New York: Free Press.

Holliday, B. G. (1985a). Developmental imperatives of social ecologies: Lessons learned from Black children. In H. P. McAdoo & J. L. McAdoo (Eds.), *Black children: Social, educational and parental environments.* Beverly Hills, CA: Sage.

Holliday, B. G. (1985b). Towards a model of teacher-child transactional processes affecting Black children's academic achievement. In M. B. Spencer, G. K. Brookins, & W. R. Allen (Eds.), *Beginnings: The social and affective development of Black children* (pp. 117–130). Hillsdale, NJ: Erlbaum.

Huang, L. N. (1989). Southeast Asian refugee children and adolescents. In J. T. Gibbs & L. N. Huang (Eds.). *Children of color* (pp. 278–321). San Francisco: Jossey-Bass.

Ignatiev, N. (1995). *How the Irish became White.* New York: Routledge & Kegan Paul.

Irvine, J. J. (1988). *Black students and school failure.* New York: Greenwood Press.

Jackson, P. W., Boostrom, R. E., & Hansen D. T. (1993). *The moral life of schools.* San Francisco, CA: Jossey-Bass.

Jaret, C. (1995). *Contemporary racial and ethnic relations.* New York: HarperCollins.

Jarrett, R. L. (1994). Living poor: Family life among single parent, African American women. *Social Problems, 41,* 30–49.

Jarrett, R. L. (1995). Growing up poor: The family experiences of socially mobile youth in low-income African-American neighborhoods. *Journal of Adolescent Research, 10,* 111–135.

Joe, S., & Kaplan, M. S. (2002, March). Firearm-related suicide among young African American males. *Psychiatric Services, 53*(3), 332–334.

Johnson, D. J. (1988). Racial socialization strategies of parents in three Black private schools. In D. T. Slaughter & D. J. Johnson (Eds.), *Visible now: Blacks in private schools* (pp. 251–267). New York: Greenwood Press.

Johnson-Powell, G., & Yamamoto, Y. (Eds.). (1997). *Transcultural child psychiatry: A portrait of American's children.* New York: Wiley.

Kardiner, A., & Ovesey, L. (1951). *The mark of oppression: Explorations in the personality of the American Negro.* New York: Norton.

Kennell, J., & Klaus, M. (1982). *Parent-infant bonding* (2nd ed.). St. Louis: Mosby.

Kennell, J. H., Trause, M. A., & Klaus, M. H. (1975). Evidence for a sensitive period in the human mother. In *Ciba Foundation Symposium: Vol. 33. Parent-infant interaction* (New series, pp. 87–102).

Klaus, M. H., & Kennel, J. H. (1976). *Maternal-infant bonding.* St. Louis, MO: Mosby.

Klaus, M. H., & Kennel, J. H. (1976). *Maternal-infant bonding: The impact of early separation or loss on family development.* St. Louis, MO: Mosby.

Klaus, M., & Kennel, J. (1983). *Parent-infant bonding.* St. Louis, MO: Mosby.

Klaus, P. H., Kennel, J. H., & Klaus, M. H. (1995). *Bonding: Building the foundations of secure attachment and independence.* Reading, MA: Addison-Wesley.

Koshy, S. (1998). Category crisis: South Asian Americans and questions of race and ethnicity. *Diaspora, 7*(3), 285–320.

Kottak, C. P. (1987). *Cultural anthropology.* New York: Random House.

Ladner, J. A. (1972). *Tomorrow's tomorrow: The Black woman.* New York: Doubleday.

Ladson-Billings, G. (1994). *The dream keepers: Successful teachers of African-American children.* San Francisco: Jossey-Bass.

LaFromboise, T. D., Coleman, H. L., & Gerton, J. (1993). Psychological impact of biculturalism: Evidence and theory. *Psychological Bulletin, 114,* 395–412.

Lal, S. (2002). Giving children security: Mamie Phipps Clark and the racializing of child psychology. *American Psychologist, 57*(1), 20–28.

Lee, C., Spencer, M. B., & Harpalani, V. (2003). Every shut eye ain't sleep: Studying how people live culturally. *Educational Researcher, 32,* 6–13.

Lesser, G., & Stodolsky, S. (1967). Learning patterns in the disadvantaged. *Harvard Educational Review, 37,* 546–593.

Lesser, G., & Stodolsky, S. (1970). Equal opportunity for maximum development. In J. S. Coleman (Ed.), *Equal educational opportunity: Harvard Educational Review* (pp. 127–138). Cambridge, MA: Harvard University Press.

Lewin, K. (1935). *A dynamic theory of personality.* New York: McGraw-Hill.

Liebow, E. (1968). *Tally's corner: A study of Negro streetcorner men.* Boston: Little, Brown.

Liu, W. T., Yu, E., Chang, C. F., & Fernandez, M. (1990). The mental health of Asian American teenagers: A research challenge. In A. R. Stiffman & L. E. Davis (Eds.), *Ethnic issues in adolescent mental health* (pp. 92–112). Newbury Park: Sage.

Luthar, S. S. (2003). *Resilience and vulnerability: Adaptation in the context of childhood adversities.* Cambridge: Cambridge University Press.

Luthar, S. S., & Cicchetti, D. (2000). The construct of resilience: Implications for interventions and social policies. *Development and Psychopathology, 12,* 857–885.

MacLeod, J. (1987). *Ain't no makin' it: Leveled aspirations in a low-income neighborhood.* Boulder, CO: Westview Press.

Markus, H. R., & Kitayama, S. (1991). Cultural variation in the self-concept. In G. R. Goethals & J. Strauss (Eds.), *Multidisciplinary perspectives on the self* (pp. 18–48). New York: Springer-Verlag.

Matute-Bianchi, M. E. (1986). Ethnic identity and patterns of school success and failures among Mexican descendants and Japanese-American students in a California high school: An ethnographic analysis. *American Journal of Education, 95,* 233–255.

McArdle, C. G., & Young, N. F. (1970). Classroom discussion of racial identity or how can we make it without "acting White"? *American Journal of Orthopsychiatry, 40*(1), 135–141.

McIntosh, P. (1989). White privilege: Unpacking the invisible knapsack. *Peace and Freedom,* 10–12.

McLoyd, V. C. (1990). The impact of economic hardship on Black families and children: Psychology distress, parenting, and socioemotional development. *Child Development, 61,* 311–346.

Mehta, P. (1998). The emergence, conflicts, and integration of the bicultural self. In S. Akhtar & S. Kramer (Eds.), *The colors of childhood* (pp. 129–168). Northvale, NJ: Aronson.

Milliken v. Bradley, 418 U.S. 717 (1974).

Missouri v. Jenkins, 515 U.S. 70 (1995).

Moore, M. (2002). *Stupid white men . . . and other sorry excuses for the state of the nation!* New York: Regan Books.

Moore, M. (Director). (2002). *Bowling for Columbine* [Motion picture]. U.S. Columbia Tristar Home Video. Available from http://www.bowlingforcolumbine.com.

Nanda, S. (1974). *Cultural anthropology.* New York: VanNostrand.

Nguyen, L., & Frye, D. (1999). Children's theory of mind: Understanding desire, belief, and emotion with social referents. *Social Development, 8,* 70–92.

Obidah, J. E. (2001). In search of a theoretical framework. In R. O. Mabokela & A. L. Green (Eds.), *Sisters of the academy: Emergent Black women scholars in higher education* (pp. 43–54). Sterling, VA: Stylus Publishing.

Ogbu, J. (1985). A cultural ecology of competence among inner-city Blacks. In M. B. Spencer, G. K. Brookins, & W. R. Allen (Eds.), *Beginnings: The social and affective development of Black children* (pp. 45–66). Hillsdale, NJ: Erlbaum.

Ogbu, J. U. (1986). The consequences of the American caste system. In U. Neisser (Ed.), *The school achievement of minority children: New perspectives* (pp. 19–56). Hillsdale NJ: Erlbaum.

Ogbu, J. U. (1987). Variability in minority school performance: A problem in search of an explanation. *Anthropology and Education Quarterly, 18,* 312–334.

Ogbu, J. U. (1990). Minority education in a comparative perspective. *Journal of Negro Education, 59*(1), 45–56.

Omi, M., & Winant, H. (1994). *Racial formation in the United States* (2nd ed.). New York: Routledge.

Omi, M., & Winant, H. (2002). Racial formation. In P. Essed & D. T. Goldberg (Eds.), *Race critical theories: Text and context (pp. 123–145).* Malden, MA: Blackwell.

Oyemade, U. J. (1985). The rationale for Head Start as a vehicle for the upward mobility of minority families: A minority perspective. *American Journal of Orthopsychiatry, 55*(4) 591–602.

Pettigrew, T. F. (1964). *A profile of the Negro American.* Princeton, NJ: Van Nostrand.

Phelan, P., Davidson, A. L., & Cao, H. T. (1991). Students' multiple worlds: Negotiating the boundaries of family, peer, and school cultures. *Anthropology and Education Quarterly, 22,* 224–250.

Piaget, J. (1926). *The language and thought of the child.* New York: Harcourt, Brace and World.

Piaget, J. (1967). *Six psychological studies.* New York: Vintage.

Plessy v. Ferguson, 163 U.S. 537 (1896), pp. 550–551.

Plomin, R., DeFries, J. C., & Loehlin, J. C. (1977). Genotype-environment interaction and correlation in the analysis of human behavior. *Psychological Bulletin, 84,* 309–322.

Prashad, V. (2000). *The karma of Brown folk*. Minneapolis, MN: University of Minnesota Press.

Riksen-Walraven, J. M. A. (1978). Effects of caregive behavior on habituation rate and self-efficacy in infants. *International Journal of Behavioral Development, 1,* 105–130.

Rimer, S., & Arenson, K. W. (2004, June). Top colleges take more blacks, but which ones? Retrieved December 6, 2005 from the *New York Times* website: http://select.nytimes.com/gst/abstract.html?res=F00917FC355D0C778EDDAF0894DC404482

Roediger, D. R. (1991). *The wages of whiteness: Race and the making of the American working class.* New York: Verso.

Roediger, D. R. (1994). *The abolition of whiteness.* New York: Verso.

Roediger, D. R. (2001). Whiteness and ethnicity in the history of "White Ethnics" in the United States. In P. Essed & D. T. Goldberg (Eds.), *Race critical theories: Text and context* (pp. 325–343). Malden, MA: Blackwell.

Sarat, A. (1997). *Race, law and culture: Reflections on Brown v. Board of Education.* New York: Oxford University Press.

Scarr, S. (1988). How genotypes and environments combine: Development and individual differences. In N. Bolger & A. Caspi (Eds.), *Persons in context: Developmental processes—Human development in cultural and historical contexts* (pp. 217–244). New York: Cambridge University Press.

Scarr, S., & McCartney, K. (1983). How people make their own environments: A theory of genotype-environment effects. *Child Development, 54,* 424–435.

Scarr-Salapatek, S. (1971). Race, social class, and IQ. *Science, 174,* 1285–1295.

Schultz, D. (1976). *Theories of personality.* Monterey, CA: Brooks/Cole.

Sethi, S., Lepper, M. R., & Ross, L. (1999). Independence from whom? Interdependence with whom? Cultural perspectives on ingroups versus outgroups. In D. Miller & D. Prentice (Eds.), *Cultural divides: Understanding and overcoming group conflicts* (pp. 273–301). New York: Sage.

Slaughter, D. T., & Johnson, D. (1988). *Visible now: Blacks in private schools.* New York: Greenwood Press.

Spencer, M. B. (1970). *The effects of systematic social (puppet) and token reinforcement on the modification of racial and color concept-attitudes in preschool aged children.* Unpublished master's thesis, University of Kansas, Lawrence.

Spencer, M. B. (1976, August). *The competence model as a viable alternative to IQ test gamesmanship.* Proceedings of the Association of Black Psychologists, Chicago.

Spencer, M. B. (1981a). Personal and group identity of Black children: An alternative synthesis. *Genetic Psychology Monographs, 106,* 59–84.

Spencer, M. B. (1981b). Preschool children's social cognition and cultural cognition: A cognitive developmental interpretation of race dissonance findings. *Journal of Psychology, 112,* 275–286.

Spencer, M. B. (1982). Preschool children's social cognition and cultural cognition: A cognitive developmental interpretation of race dissonance findings. *Journal of Psychology, 112,* 275–286.

Spencer, M. B. (1983). Children's cultural values and parental child rearing strategies. *Developmental Review, 3,* 351–370.

Spencer, M. B. (1984). Black children's race awareness, racial attitudes and self-concept: A reinterpretation. *Journal of Child Psychology and Psychiatry, 25*(3), 433–441.

Spencer, M. B. (1985). Cultural cognition and social cognition as identity factors in Black children's personal-social growth. In M. B. Spencer, G. K. Brookins, & W. R. Allen (Eds.), *Beginnings: The social and affective development of Black children* (pp. 215–230). Hillsdale, NJ: Erlbaum.

Spencer, M. B. (1988). Self-concept development. In D. T. Slaughter (Ed.), *Perspectives on Black child development: New directions for child development* (pp. 59–72). San Francisco: Jossey-Bass.

Spencer, M. B. (1990). Parental values transmission: Implications for the development of African-American children. In J. B. Stewart & H. Cheatham (Eds.), *Interdisciplinary perspectives on Black families* (pp. 111–130). Atlanta, GA: Transactions.

Spencer, M. B. (1995). Old issues and new theorizing about African American youth: A phenomenological variant of ecological systems theory. In R. L. Taylor (Ed.), *Black youth: Perspectives on their status in the United States* (pp. 37–70). Westport, CT: Praeger.

Spencer, M. B. (1999a). Social and cultural influences on school adjustment: The application of an identity-focused cultural ecological perspective. *Educational Psychologist, 34,* 43–57.

Spencer, M. B. (1999b). Transitions and continuities in cultural values: Kenneth Clark revisited. In R. L. Jones (Ed.), *African American children, youth, and parenting* (pp. 183–208). Hampton, VA: Cobb & Henry.

Spencer, M. B. (2001). Identity, achievement orientation and race: "Lessons learned" about the normative developmental experiences of African American males. In W. Watkins, et al. (Eds.), *Race and education: The role of history and society in educating African American students* (pp. 100–127). Needham Heights, MA: Allyn & Bacon.

Spencer, M. B. (2005). Crafting identities and accessing opportunity post *Brown. American Psychologist, 60(8),* 821–830.

Spencer, M. B., Brookins, G. K., & Allen, W. R. (Eds.). (1985). *Beginnings: Vol. 1. The social and affective development of Black children.* Hillsdale, NJ: Erlbaum.

Spencer, M. B., & Cassidy, E. (2004). *A broader view of service learning: Using a phenomenological approach to frame service learning among high-school-aged youth.* Chapter prepared for the Robert Wood Johnson Foundation.

Spencer, M. B., Cross, Jr., W. E., Harpalani, V., & Goss, T. N. (2003). Debunking the "acting white" myth and posing new directions for research. In C. C. Yeakey & R. D. Henderson (Eds.), *Surmounting all odds: Education, opportunity, and society in the new millennium* (pp. 273–304). Greenwich, CT: Information Age.

Spencer, M. B., & Dornbusch, S. (1990). Challenges in studying minority youth. In S. Feldman & G. Elliot (Eds.), *At the threshold: The developing adolescent* (pp. 123–146). Cambridge, MA: Harvard University Press.

Spencer, M. B., Dupree, D., Cunningham, M., Harpalani, V., & Munoz-Miller, M. (2003). Vulnerability to violence: A contextually-sensitive, developmental perspective on African American adolescents. *Journal of Social Issues, 59*(1) 33–49.

Spencer, M. B., Dupree, D., & Hartmann, T. (1997). A Phenomenological Variant of Ecological Systems Theory (PVEST): A self-organization perspective in context. *Development and Psychopathology, 9,* 817–833.

Spencer, M. B., Dupree, D., Swanson, D. P., & Cunningham, M. (1996). Parental monitoring and adolescents' sense of responsibility for their own learning: An examination of sex differences. *Journal of Negro Education, 65*(1), 30–43.

Spencer, M. B., Dupree, D., Swanson, D. P., & Cunningham, M. (1998). The influence of physical maturation and hassles on African American adolescents' learning behaviors. *Journal of Comparative Family Studies, 29,* 189–200.

Spencer, M. B., Fegley, S., & Harpalani, V. (2003). A theoretical and empirical examination of identity as coping: Linking coping resources to the self processes of African American youth. *Journal of Applied Developmental Science, 7*(3), 181–187.

Spencer, M. B., & Harpalani, V. (2004). Nature, nurture, & the question of "How?": A phenomenological variant of ecological systems theory. In C. Garcia-Coll, K. Kearer, & R. Lerner (Eds.), *Nature and nurture: The complex interplay of genetic and environmental influences on human behavior and development* (pp. 53–77). Mahwah, NJ: Erlbaum.

Spencer, M. B., & Harpalani, V. (under review). What does "acting White" actually mean? Racial identity, adolescent development, and academic achievement among African American youth. In

J. U. Ogbu (Ed.), *Minority status, collective identity and schooling*. Mahwah, NJ: Erlbaum.

Spencer, M. B., Harpalani, V., Cassidy, E., Jacobs, C., Donde, S., Goss, T., et al. (2006). Understanding vulnerability and resilience from a normative development perspective:Vol. 1. Implications for racially and ethnically diverse youth (pp. 627–672). In D. Cicchetti & E. Cohen (Eds.), *Handbook of Development and Psychopathology.* Hoboken, NJ: Wiley.

Spencer, M. B., Hartmann, T. T., & Dupree, D. (1997). A Phenomenological Variant of Ecological Systems Theory (PVEST): A self-organization perspective in context. *Development and Psychopathology, 9,* 817–833.

Spencer, M. B., & Horowitz, F. D. (1973). Effects of systematic social and token reinforcement on the modification of racial and color concept attitudes in Black and in White pre-school children. *Developmental Psychology, 9,* 246–254.

Spencer, M. B., & Jones-Walker, C. (2004). Interventions and services offered to former juvenile offenders reentering their communities: An analysis of program effectiveness. *Journal of Youth Violence and Juvenile Justice, 1*(2), 88–97.

Spencer, M. B., & Markstrom-Adams, C. (1990). Identity processes among racial and ethnic minority children in America. *Child Development, 61,* 290–310.

Spencer, M. B., Noll, E., Stoltzfus, J., & Harpalani, V. (2001). Identity and school adjustment: Revisiting the "acting White" assumption. *Educational Psychologist, 36*(1), 21–30.

Spencer, M. B., Silver, L. J., Seaton, G., Tucker, S. R., Cunningham, M., & Harpalani, V. (2001). Race and gender influences on teen parenting: An identity-focused cultural-ecological perspective. In T. Urdan & F. Pajares (Eds.), *Adolescence and education: General issues in the education of adolescents* (pp. 231–268). Greenwich, CT: Information Age Publishing.

Spencer, M. B., & Swanson, D. P. (2000). Promoting positive outcomes for youth: Resourceful families and communities. In S. Danziger & J. Waldfogel (Eds.), *Securing the future* (pp. 182–204). New York: Russell Sage Foundation Press.

Steele, C. (1997). A threat in the air: How stereotypes shape intellectual identity and performance. *American Psychologist, 52,* 613–629.

Steele, C. (2004, April). *Endowed lectureship on stereotype threat.* Sponsored by the Provost Office, University of Michigan.

Steele, C. M., & Aronson, J. (1995). Stereotype threat and the intellectual test performance of African-Americans. *Journal of Personality and Social Psychology, 69,* 797–811.

Steinberg, L. (1985). *Adolescence.* New York: Alfred A. Knopf.

Stevenson, H. C. (1997). Missed, dissed, and pissed: Making meaning of neighborhood risk, fear and anger management in urban Black youth. *Cultural Diversity and Mental Health, 3,* 37–52.

Stoler, A. L. (2002). Racial histories and their regimes of truth. In P. Essed & D. T. Goldberg (Eds.), *Race critical theories: Text and context.* Malden, MA: Blackwell.

Sullivan, M. (1989). *Getting paid: Youth, crime and work in the inner city.* Ithaca, NY: Cornell University Press.

Swanson, D., Cunningham, M., & Spencer, M. B. (2003). Black males' structural conditions, achievement patterns, normative needs, and "opportunities." *Urban Education Journal, 38,* 608–633.

Swanson, D. P., & Spencer, M. B. (1999). Developmental and cultural context considerations for research on African American adolescents. In H. Fitzgerald, B. M. Lester, & B. Zuckerman (Eds.), *Children of color: Research, health and public policy issues* (pp. 53–72). New York: Garland.

Swanson, D. P., Spencer, M. B., Dell'Angleo, T., Harpalani, V., & Spencer, T. (2002). Identity processes and the positive youth development of African Americans: An explanatory framework. In G. Noam (Series Ed.) & C. S. Taylor, R. M. Lerner, & A. von Eye (Eds.), *Pathways to positive youth development among gang and non-gang youth: New directions for youth development* (No. 95, pp. 73–99). San Francisco: Jossey-Bass.

Swanson, D. P., Spencer, M. B., Harpalani, V., Noll, L., Seaton, G., & Ginzberg, S. (2003). Psychosocial development in racially and ethnically diverse groups: Conceptual and methodological changes in the 21st century. *Development and Psychopathology, 15,* 743–771.

Swanson, D. P., Spencer, M. B., & Petersen, A. (1998). Identity formation in adolescence. In K. Borman & B. Schneider (Eds.), *The adolescent years: Pt. 1. Social influences and educational challenges, ninety-seventh Yearbook of the National Society for the Study of Education* (pp. 18–41). Chicago: University of Chicago Press.

Triandis, H. C. (1989). The self and social behavior in differing cultural contexts. *Psychological Review, 96,* 506–520.

Trueba, H. T. (1988). Culturally based explanations of minority students' academic achievement. *Anthropology and Education Quarterly, 19*(3), 270–287.

West, C. (2002). A genealogy of modern racism. In P. Essed & D. T. Goldberg (Eds.), *Race critical theories: Text and context.* Malden, MA: Blackwell.

White, R. (1959). Motivation reconsidered: The concept of competence. *Psychological Review, 66,* 297–333.

White, R. (1960). Competence and psychosexual development. In M. R. Riley (Ed.), *Nebraska Symposium on Motivation* (pp. 3–32). Lincoln: University of Nebraska Press.

White, S. H. (1996). Foreword. In M. Cole (Ed.), *Cultural psychology: A once and future discipline (p. ix).* Cambridge, MA: Belknap-Harvard Press.

Wohlwill, J. F. (1985). The confluence of environmental and developmental psychology: Signpost to an ecology of development? *Human Development, 23,* 354–358.

Wohlwill, J. F., & Heft, H. (1987). The physical environment and the development of the child. In D. Stokols & I. Altman (Eds.), *Handbook of environmental psychology* (Vol.1, pp. 281–328). New York: Wiley.

Woodson, C. G. (1919). *The education of the Negro prior to 1861: A history of the education of the colored people of the United States from the beginning of slavery to the Civil War.* Washington, DC: Associated.

Wright, H. F. (1967). *Recording and analyzing child behavior.* New York: Harper & Row.

Youngblood, J., & Spencer, M. B. (2002). Integrating normative identity processes and academic support requirements for special needs adolescents: The application of an Identity-Focused Cultural Ecological (ICE) Perspective. *Journal of Applied Developmental Science, 6,* 95–108.

CHAPTER 16

Positive Youth Development: Theory, Research, and Applications

PETER L. BENSON, PETER C. SCALES, STEPHEN F. HAMILTON, and ARTURO SESMA JR.

DEFINING POSITIVE YOUTH DEVELOPMENT 895
POSITIVE YOUTH DEVELOPMENT IN HISTORICAL AND SOCIAL CONTEXT 898
THE THEORY OF POSITIVE YOUTH DEVELOPMENT 901
Human Development 902
Conceptual Models of Positive Development 905
The Theory of Context and Community Influence 910
The Theory of Context and Community Change 913
RESEARCH SUPPORT FOR KEY POSITIVE YOUTH DEVELOPMENT HYPOTHESES 914
Overview of Positive Youth Development Research 915
How Much Explanatory Power Is Reasonable to Expect? 915
Hypothesis One 916
Hypothesis Two 917
Hypothesis Three 920
Hypothesis Four 921
Hypothesis Five 923
Hypothesis Six 926
Hypothesis Seven 928
YOUTH DEVELOPMENT RESEARCH 928
Gender 928
Age 928
Race/Ethnicity and SES 929
DIRECTIONS FOR FUTURE RESEARCH 930
CONCLUSIONS 932
REFERENCES 933

Positive youth development is simultaneously a field of research and an arena of practice. Linked more by shared ideals than by formal membership or credentials, positive youth development includes a growing number of programs, agencies, foundations, federal grant programs, policy initiatives, researchers, and youth-serving professionals committed to promoting competent, healthy, and successful youth. Collectively, they have generated ideas, data, and resources. At the same time, they have unleashed a wave of energy and action not unlike that of a social movement, with a multitude of community actors connecting to a broad set of principles, concepts, and strategies for increasing youth access to the kinds of relationships, programs, settings, and activities known (or assumed) to promote healthy development.

Positive youth development is an umbrella term that covers many streams of work. It is variously a field of interdisciplinary research, a policy approach, a philosophy, an academic major, a program description, and a professional identity (e.g., youth development worker). The "idea" of positive youth development reaches into a number of fields, including child and adolescent developmental psychology, public health, health promotion, prevention, sociology, social work, medicine, and education. Within the past few years, positive youth development has been a focal topic in a wide range of scholarly journals, including *The Annals of the American Academy of Political and Social Science* (January, 2004), *Prevention and Treatment* (June, 2002), *The Prevention Researcher* (April, 2004), and the *American Journal of Health Behavior* (July, 2003). Two established research journals, *Applied Developmental Science* and *New Directions in Youth Development,* help to ground the field.

Undergirding positive youth development is an important and growing line of scientific inquiry, including theory, research, and a set of conceptual models and frameworks that both guide and emerge from the

The writing of this chapter was supported by a grant to Search Institute from The Lilly Endowment.

research. This chapter: (a) defines the concept of positive youth development; (b) presents a broad theory of this sphere of human development; (c) examines empirical support for a series of theory-driven hypotheses; and (d) proposes implications for theory reformulation, future research, and applications.

DEFINING POSITIVE YOUTH DEVELOPMENT

As noted, the field of positive youth development encompasses a vast territory of disciplines, concepts, and strategies. One recent review of positive youth development (Benson & Pittman, 2001a) suggests four distinguishing features of this field. It is *comprehensive* in its scope, linking a variety of: (1) ecological contexts (e.g., relationships, programs, families, schools, neighborhoods, congregations, communities) to (2) the production of experiences, supports, and opportunities known to (3) enhance positive developmental outcomes. Its primary organizing principle is *promotion* (of youth access to positive experiences, resources and opportunities, and of developmental outcomes useful to both self and society). It is, as the term implies, *developmental,* with emphasis on growth and an increasing recognition that youth can (and should be) deliberate actors in the production of positive development. And it is *symbiotic,* drawing into its orbit ideas, strategies, and practices from many lines of inquiry (e.g., resiliency, prevention, public health, community organizing, developmental psychology).

Damon (2004; Damon & Gregory, 2003) argues that positive youth development represents a sea change in psychological theory and research, with observable consequences for a variety of fields including education and social policy. Three central themes are noted here. In Damon's view, positive youth development takes a strength-based approach to defining and understanding the developmental process. More precisely, it "emphasizes the manifest potentialities rather than the supposed incapacities of young people . . ." (2004, p. 15). There is more to this statement than initially meets the eye. It connotes a significant critique of mainstream psychological inquiry that is quite ubiquitous in the positive youth development literature. This critique is that understandings of child and adolescent development have been so dominated by the exploration and remediation of pathology and deficit that we have an incomplete—if not distorted—view of how organisms develop. This ongoing debate is addressed in more detail in the next section.

Second, Damon, like many other positive youth development advocates, holds up the centrality of community as both an incubator of positive development as well as a multifaceted setting in which young people can exercise agency and inform the settings, places, people, and policies that in turn impact their development. Finally, Damon notes that positive youth development, in its efforts to identify the positive attitudes and competencies that energize healthy developmental trajectories, is not afraid to identify values, moral perspectives, and religious worldviews as constructive developmental resources even though this "flies in the face of our predominantly secular social-science traditions" (2004, p. 21).

Several other accents or themes are increasingly prominent in the youth development literature. Two are particularly germane for positioning this field in intellectual and scientific space. A number of scholars argue that the definition of developmental success most deeply entrenched in public policy and practice conceives of health as the absence of disease or pathology. In recent decades, the dominant framework driving federal, state, and local interventions with youth has been that of risk behaviors, including alcohol use, tobacco use, other drug use, nonmarital pregnancy, suicide, antisocial behavior, violence, and school drop out (Benson, 1997; Hein, 2003; National Research Council & Institute of Medicine [NRCIM], 2002; Takanishi, 1993). While positive youth development advocates readily accept that reductions in these health-compromising behaviors are important markers of developmental success, there is simultaneously a growing interest in defining "the other side of the coin"—that is, the attributes, skills, competencies, and potentials needed to succeed in the spheres of work, family, and civic life. This dichotomy is well captured in the youth development mantra "problem free" is not fully prepared (Pittman & Fleming, 1991). Accordingly, an important aspect of current positive youth development science is the conceptualization and measurement of dimensions of positive developmental success. Among these areas of work are efforts to define indicators of child well-being (Moore, 1997; Moore, Lippman, & Brown, 2004), thriving (Benson, 2003a; Lerner, 2004; Lerner et al., in press; Scales & Benson, 2004; Theokas et al., 2004), and flourishing (Keyes,

2003). Within this inquiry on positive markers of success, an emerging issue has to do with expanding the conceptualization of developmental success to include not only what promotes individual well-being but also what promotes the social good (Benson & Leffert, 2001; Benson, Mannes, Pittman, & Ferber, 2004; Damon, 1997; Lerner, 2004).

In turn, this interest in positive indicators covaries with an emerging accent on reconceptualizing the population target for improving the lives of children and youth. This is the debate about "at-risk youth" versus "all youth." In the early stages of the term's emergence, positive youth development tended to be positioned as a strategy—complementary to reducing risks—for preventing high-risk behaviors, particularly among that subset of youth particularly susceptible to the potential harm of poverty and dysfunctional families and/or communities. As work moves forward to expand the notions of health, well-being, and developmental success, and as these ideas merge with historical and sociological insights about pervasive societal changes, the positive youth development field increasingly calls for strategic national and community investments to strengthen the developmental landscape more generally (Bumbarger & Greenberg, 2002; Lerner, 2000; Lorion & Sokoloff, 2003). Ultimately, we might characterize this issue as whether the national priority should be to promote "good enough" development or to promote optimal development. In more poetic language, Lorion and Sokoloff (2003) offer that this choice is between "fixing" troubled youth and the view that "all soil can be enriched and all moisture and sunlight maximally used to nourish all flowers" (p. 137).

Several attempts have been made to articulate the core concepts and principles in the positive youth development field (Benson & Pittman, 2001a, 2001b; Catalano, Berglund, Ryan, Lonczak, & Hawkins, 1999; Hamilton, Hamilton, & Pittman, 2004; NRCIM, 2002). A synthesis of these reviews suggests considerable consensus on these six principles:

1. All youth have the inherent capacity for positive growth and development.
2. A positive developmental trajectory is enabled when youth are embedded in relationships, contexts, and ecologies that nurture their development.
3. The promotion of positive development is further enabled when youth participate in multiple, nutrient-rich relationships, contexts, and ecologies.
4. All youth benefit from these relationships, contexts, and ecologies. Support, empowerment, and engagement are, for example, important developmental assets for all youth, generalizing across race, ethnicity, gender, and family income. However, the strategies and tactics for promoting these developmental assets can vary considerably as a function of social location.
5. Community is a viable and critical "delivery system" for positive youth development.
6. Youth are major actors in their own development and are significant (and underutilized) resources for creating the kinds of relationships, contexts, ecologies, and communities that enable positive youth development.

There are many published definitions of positive youth development. Indeed, most reviewers of the literature and many authors of positive youth development research articles generate new definitions. This proliferation of many definitions—as well as concomitant lack of consensus on a particular definition—reflects both the relative newness of the field as well as its profoundly interdisciplinary nature. Each definition focuses on some combination (and the interactions among them) of the core constructs displayed in Figure 16.1.

Figure 16.1 suggests that the core ideas in positive youth development include (A) developmental contexts (i.e., places, settings, ecologies, and relationships with the potential to generate supports, opportunities, and resources); (B) the nature of the child with accents on inherent capacity to grow and thrive (and actively engage with supportive contexts); (C) developmental strengths (attributes of the person, including skills, competencies, values, and dispositions important for successful engagement in the world); and two complimentary conceptualizations of developmental success; (D) the reduction of high-risk behavior; and (E) the promotion of thriving. The bidirectional arrows intend to convey the dynamic nature of person-ecology interactions prominent in recent expositions of positive youth development (Lerner, 2003, 2004).

We know of no definition that encompasses all of this conceptual territory. But the fullness of these constructs is evident when integrating a representative sample of published definitions. Several accent the nature of the child (B). Damon (2004), for example, offers that "the positive youth development perspective emphasizes the manifest potentialities rather than the supposed incapacities of young people—including young people from the most disadvantaged backgrounds and those with the most troubled histories" (p. 17).

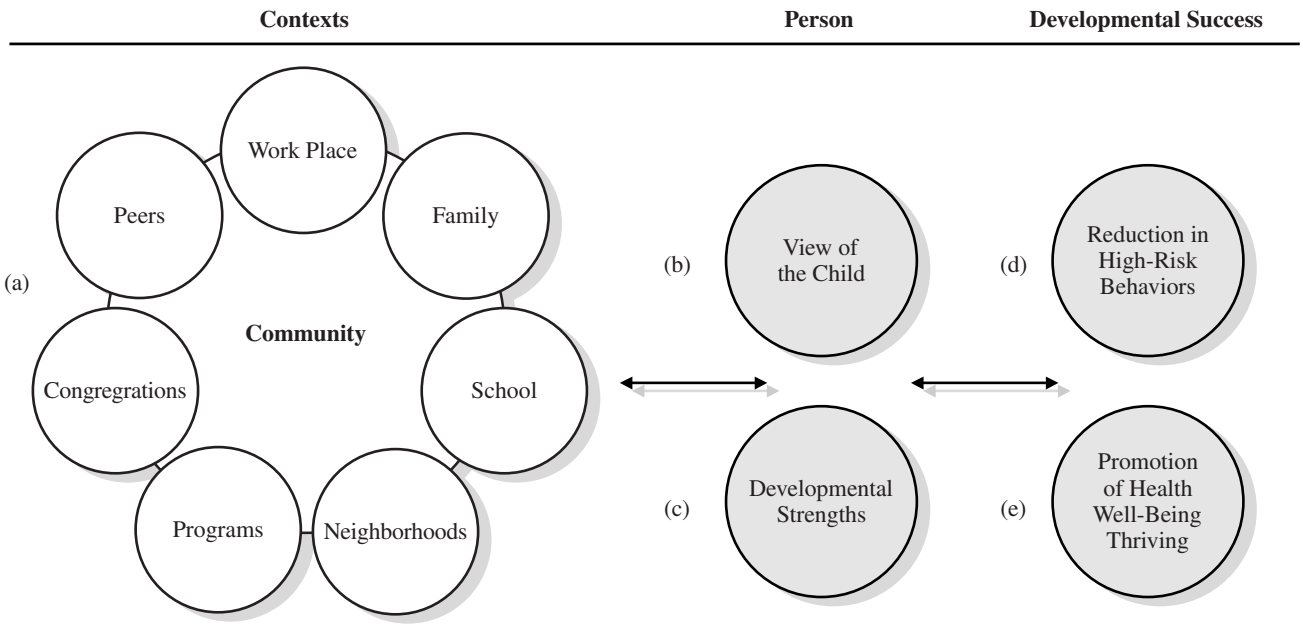


Figure 16.1 Core positive youth development constructs.

Hamilton (1999; Hamilton et al., 2004) noted that the term has been used in three ways. His first definition reflects, like Damon, an articulation of the nature of the child (B in Figure 16.1): "youth development has traditionally been and is still most widely used to mean a natural process: the growing capacity of a young person to understand and act on the environment" (Hamilton et al., 2004, p. 3). His second definition picks up the role of contexts (A in Figure 16.1) in the development of strengths (C): "in the 1990s the term youth development came to be applied to a set of principles, a philosophy or approach emphasizing active support for the growing capacity of young people by individuals, organizations and institutions, especially at the community level" (Hamilton et al., 2004, p. 4). Finally, youth development also refers to a "planned set of practices, or activities, that foster the developmental process in young people" (Hamilton et al., 2004, p. 4). These practices occur within the context portion (A) of Figure 16.1 and can be delivered via programs, organizations, or community initiatives.

Catalano et al. (1999, 2004) conducted a major review of the positive youth development field with support from the National Institute of Child Health and Human Development (NICHD). Among its purposes were to "research and establish both theoretical and empirical definitions of positive youth development" (Catalano et al., 1999, p. ii). Arguing that no comprehensive definition of the term could be found, they created a definition that named the objectives of positive youth development approaches. Hence, positive youth development seeks to promote one or more of the following: bonding, resilience, social competence, emotional competence, cognitive competence, behavioral competence, moral competence, self-determination, spirituality, self-efficacy, positive identity, belief in the future, recognition for positive behavior, opportunities for prosocial involvement, and prosocial norms. This definition, then, focuses on describing the territories of (C) developmental strengths and (E) well-being in Figure 16.1.

In 2002, the National Research Council and Institute of Medicine released the influential report, *Community Programs to Promote Youth Development* (NRCIM, 2002). Though this report did not offer a clear definition of the term, its focus was on defining (and advocating for) two of the constructs in Figure 16.1: "the personal and social assets" young people need "to function well during adolescence and adulthood" (p. 3) and the features of positive developmental settings. These two represent constructs C and A in Figure 16.1.

Larson (2000) contrasts positive youth development with developmental psychopathology and suggests the former is about "how things go right" while the latter focuses on "how things go wrong." Hence, his focus is on positive youth development as a line of inquiry regarding "the pathways whereby children and adolescents become motivated, directed, socially competent,

compassionate and psycholocally vigorous adults" (p. 170). The pathways organically link contexts (A), developmental strengths (C) and developmental success (D and E). In a similar vein, Lerner's definition (Lerner, Fisher, & Weinberg, 2000) contrasts pathology—reducing and asset-building approaches. "Preventing the actualization of youth risk behaviors is not the same thing as taking actions to promote positive youth development (e.g., the inculcation of attributes such as caring/compassion, competence, character, connection, and confidence). Similarly, programs and policies that prevent youth problems do not necessarily prepare youth to contribute to civil society" (p. 12).

Some recent definitions place additional accent on the processes and dynamics of designing and mobilizing developmental contexts (A in Figure 16.1) to enhance C, D, E, and their intersection. Benson and Saito (2001), for example, suggested that "youth development mobilizes programs, organizations, systems and communities to build developmental strengths in order to promote health and well-being" (p. 144). Finally, Small and Memmo (2004) identify a variant on positive youth development that places an important accent on mobilizing youth to shape their contexts and communities. Called Community Youth Development (Hughes & Curnan, 2000; Perkins, Borden, & Villarruel, 2001; Perkins, Borden, Keith, Hoppe-Rooney, & Villarruel, 2003), this approach takes seriously the bidirectional arrow in Figure 16.1 connecting A with B and C. As we will see in the section on the theory of youth development, this bidirectionality is a central feature of developmental systems theory and in particular, Lerner's application of this theory to positive youth development (Lerner, 2003, 2004; Lerner, Brentano, Dowling, & Anderson, 2002).

POSITIVE YOUTH DEVELOPMENT IN HISTORICAL AND SOCIAL CONTEXT

Early uses of the term *youth development* can be found in the literature on juvenile delinquency. In 1947, the Texas State Development Council was formed following a report from a blue-ribbon commission charging that the state-run schools for delinquent children were failing. Embedded in the report was the suggestion that the causes of delinquency included environmental factors with the implication that well-entrenched models of changing behavior by "fixing the child" were insufficient. This new understanding of the contextual backdrop to individual development gained further momentum in a series of monographs from the University of Chicago's experimental Community Youth Development Program, an initiative designed to identify and organize community resources to better serve youth with "special problems" or "special abilities" (Havighurst, 1953).

Federal agencies dealing with juvenile delinquency expanded on their earlier efforts and took another important conceptual step. In 1970, the Youth Development and Delinquency Prevention Administration (housed in what was then the Department of Health, Education, and Welfare) developed a delinquency prevention program based on what keeps "good kids on track" rather than the more prevalent question of the day ("why do kids get into trouble?"; West, 1974). The federal answer to the question of why some youth succeed had four components: a sense of competence, a sense of usefulness, a sense of belonging, and a sense of power (U.S. Department of Health and Human Services Administration for Children and Families, 1996, p. 4).

In these state and federal approaches to addressing "troubled and troubling youth," we see the early signs of two cornerstones of contemporary youth development approaches: the primacy of context for shaping development and development understood in terms of strength rather than deficit. Though such ideas hardly seem like intellectual advances now, it is important to note how these ideas came to challenge historical and deeply entrenched therapeutic models.

Subsequently, a number of prominent foundations entered the picture. In addition to major youth development grant programs at the Kellogg Foundation, the Lilly Endowment, and the Kauffman Foundation, the Carnegie Corporation of New York and the William T. Grant Foundation sponsored and broadly disseminated pivotal reports on the developmental trajectories of American youth. Moving beyond the question of how society best deals with its so-called "at-risk youth," these influential reports began to document more persistent and pervasive issues about health and well-being of American youth. To some extent, the reports expanded the need for enhancing developmental supports and opportunities to include most young people.

In 1985, the Carnegie Corporation launched the Carnegie Council on Adolescent Development. The concluding report, *Great Transitions: Preparing Adolescents for a New Century,* sought to focus the national spotlight on adolescence (Carnegie Council on Adolescent Development, 1995). The report, like many before it, lamented not only the high rates of high risk behaviors (e.g., alcohol use, illicit drug use, teen pregnancy)

and exposure to developmental threats (e.g., physical and sexual abuse) among adolescents, but the emergence of alarming rates for these phenomena among 10- to 15-year-olds. Unlike other reports on the health of youth, however, the Carnegie Council proposed solutions based less on services to and treatment of youth and more on altering the formative contexts of families, schools, community organizations, and the media. Among key recommendations were reengaging families with their adolescent children, designing developmentally attentive schools, and transforming the media into a socially constructive resource. And in a reaffirmation of the Carnegie Council's early report, *A Matter of Time: Risk and Opportunity in the Non School Hours* (Carnegie Corporation of New York, 1992), this 1995 report called for community investment in and expansion of "safe, growth-promoting settings during the high-risk, after school time when parents are often not able to supervise their children and adolescents" (Hamburg & Takanishi, 1996, p. 387).

Several years earlier, the William T. Grant Foundation released *The Forgotten Half: Pathways to Success for America's Youth and Young Families* (1988). Its focus was on ages 16 to 24 and the transition from adolescence to adulthood. In its words, "half of our youth are in danger of being caught in a massive bind that can deny them full participation in our society and the full benefit of their own talents" (p. 1). Like the Carnegie Council report, *The Forgotten Half* focused its recommendations on changing community and societal contexts. Among its specific recommendations: closer adult-youth relationships, opportunities to participate in the life of community in activities valued by adults (including community service), and quality work experiences that provide skill-building pathways to sustainable work.

In combination, these two highly visible reports challenged the common assumption that the "youth problem" was confined to a small percentage of youth needing special and targeted services to redeem them. Instead, portraits of youth emerge which suggested that the developmental journey was fragile for a much larger percentage of youth. And both reports made bold calls for systemic change in how communities and their socialization systems connect with young people.

By the 1990s, three ideas generally important in the youth development field were gaining momentum. These are: identifying positive, developmental "building blocks" which help youth stay on a successful developmental trajectory; attributing causality for "youth problems" more to environments and contexts than youth themselves, with a concomitant call for reforming and/or transforming contexts; and mainstreaming the need for change (i.e., the percentage of youth needing change goes far beyond the notion of "at-risk" youth). A corollary to these three strands is the oft-repeated idea that youth are resources to be utilized rather than problems to be fixed.

Several additional events have added direction and momentum to the positive youth development movement. The first was a symbolic and galvanizing historical moment—the gathering of five living U.S. presidents (Carter, G. H. W. Bush, Clinton, Ford, and Reagan, represented by Nancy Reagan) with hundreds of influential delegates—for the President's Summit on Youth in Philadelphia. This April, 1997 event offered an accessible language of positive development—and a passionate call to action—around five fundamental development resources (or promises). These were: caring adults, safe places and structured activities, community service, education for marketable skills, and a healthy start. This 1997 event became institutionalized with the formation of America's Promise, a not-for-profit community mobilization organization initially led by (Ret.) General Colin Powell.

While this and other mobilization efforts gave impetus to the principles of positive youth development, a series of publications gave greater intellectual and scientific attention to the youth development idea. In 1998, the Youth Development Directions Project (YDDP) was conceived by the Youth Development Funders Group at a meeting held at the Ewing Marian Kauffman Foundation in Kansas City. The purpose was to take stock of the youth development field and lay out suggested direction for strengthening science, practice and policy. A number of organizations, including the Academy for Educational Development (Center for Youth Development and Research), Chapin Hall Center for Children at the University of Chicago, The Forum for Youth Investment at the International Youth Foundation, Public/Private Ventures, and Search Institute participated in a 2-year learning and writing project, culminating in one of the first efforts to capture the breadth and status of the field (Benson & Pittman, 2001b; Public/Private Ventures, 2000).

Moreover, as already noted, influential federal reports had reviewed the field of positive youth development. Both focused on the slice of youth development having to do with the creation of developmentally attentive programs. One, initiated by the Board on Children,

Youth and Families of the National Research Council, created a Committee on Community-Level Programs for Youth that evaluated and synthesized the science of adolescent development with research on the quality and efficiency of community programs designed to promote healthy development, and resulted in the influential report, *Community Programs to Promote Youth Development* (NRCIM, 2002). The second was the comprehensive review of positive youth development programs evaluations commissioned by the National Institute for Child Health and Human Development (Catalano et al., 1999).

The rise of positive youth development as a field of science and practice has been fueled by two types of social analysis. The first documents a series of pervasive societal changes that inform and shape the processes of child and adolescent socialization. It is common in published treatises on positive youth development strategies to pinpoint the role of rapid social change in altering youth access to developmental resources. In this extensive literature, social changes hypothesized to undermine the capacity of family and community to generate developmental resources include: increasing parental absence as a result of changes in the nature of work and the dramatic increase in out-of home employment of mothers; the rise of civic disengagement; the loss of shared ideals about the goals of development; the growing privatization of recreation; increases in age segregation; the decrease in neighborhood cohesion; teenagers' disconnection from structured programming; the prevalence of negative stereotypes about youth; and the explosion in media access by youth (see, e.g., Benson, 1997; Benson, Leffert, Scales, & Blyth, 1998; Damon, 1997; Dryfoos, 1990; Furstenberg, 2000; Garbarino, 1995; Lerner, 1995; Mortimer & Larson, 2002; Scales, 1991, 2001). In a particularly cogent analysis of these trends, Bronfenbrenner and Morris (1998) offered this summary:

> The research findings presented here reveal growing chaos in the lives of families, in child care settings, schools, peer groups, youth programs, neighborhoods, workplaces, and other everyday environments in which human beings live their lives. Such chaos, in turn, interrupts and undermines the formation and stability of relationships and activities that are necessary for psychological growth. (p. 1022)

The second social analysis common in the youth development literature is a critique of deficit models prominent in the service professions, policy, and research. Indeed, it is a somewhat common refrain that models focused primarily on reducing risk behaviors, for example, are inadequate both theoretically and strategically. Furthermore, models driven by risk, deficit, and pathology may unintentionally become part of the problem (e.g., by negatively labeling youth and/or fueling unfavorable stereotypes of youth). These ideas have been discussed in a wide range of positive youth development publications (Catalano et al., 1999; Lerner, 2004; Pittman, Irby, & Ferber, 2001; Roth & Brooks-Gunn, 2000; Villarruel, Perkins, Borden, & Keith, 2003). In one particularly important analysis, Larson (2000) suggests that developmental psychology has spawned a much stronger tradition for understanding and treating psychopathology than for understanding and promoting pathways to developmental success. In this regard, positive youth development advocates are sympathetic to positive psychology's critique of the dominance of pathology-oriented research and practice within mainstream psychology (Seligman & Csikszentmihalyi, 2000).

The premise that positive youth development represents a categorically different approach than so-called deficit, pathology, and risk models deserves deeper exploration. There is consensus that adolescent psychology, and applied youth areas have been dominated, in recent decades, by explorations of "youth problems." The social historian, Francis Fukuyama (1999), attributes this, in part, to a logical outgrowth of rapid social change. When social institutions become less stable—as in the United States beginning in the 1960s—governments, he noted, inevitably begin to create and measure indicators of social upheaval, and craft policy and programs to minimize social and personal problems assumed to emerge from social change (e.g., violence, alcohol, and other drug use).

Sociologist Frank Furstenberg (2000; Furstenberg, Modell, & Herschberg, 1976), argues that adolescence becomes culturally defined as a lifestage when schooling replaces work as the major activity during youth. This, he suggests, occurred in the United States near the middle of the twentieth century. The advent of full-time education "establishes a youth-based social world that is age segregated, partially buffered from adult control, and relatively turned in on itself" (2000, p. 897). Not surprisingly, societies interpret the consequences of this upheaval in terms of "youth problems." Consequently, and in line with Fukuyama's analysis, cultural authorities focus major attention on behaviors and styles that contradict established social norms. And not surpris-

ingly, social scientific studies of youth follow suit, with a disproportionate focus on problem behaviors (Dryfoos, 1998; Larson, 2000; Roth & Brooks-Gunn, 2000; Steinberg & Lerner, 2004). This dominating theme in youth research likely reflects the dual consequence of the cultural zeitgeist and the longer term hospitality in mainline psychology to the study of pathology (Larson, 2000; Moore et al., 2004; Peterson, 2004). Furstenberg (2000) provided a cogent description of the implications of these social and scientific trends for the broader public perception of youth:

> Such an approach inevitably treats successful adolescents and young adults as escape artists who manage to dodge the hazards of growing up, rather than focusing on the ways that young people acquire and master skills, construct positive identities, and learn how to negotiate social roles simultaneously in the youth culture and adult world. (p. 900)

At first glance, it would appear that positive youth development represents a theoretical, research and practice "paradigm shift" from the prevention field—a multidisciplinary area of inquiry, programming, policy, and practice with a substantial American history (Wandersman & Florin, 2003; Weissberg, Kumpfer, & Seligman, 2003). However, a considerable debate is underway about the conceptual overlap between prevention and positive youth development (Benson et al., 2004; Bumbarger & Greenberg, 2002; Catalano & Hawkins, 2002; Roth & Brooks-Gunn, 2003; Sesma, Mannes, & Scales, in press; Small & Memmo, 2004).

Prevention and prevention science are deeply rooted in public health and epidemiological approaches to disease prevention (Bloom, 1996; Small & Memmo, 2004), with a particular focus on crafting interventions before the onset of significant problems, and with a focus on populations known to be at risk for such onset (Durlak, 1998; Munóz, Mrazek, & Haggerty, 1996). This form of prevention has been called primary prevention, in contrast to secondary and tertiary prevention (Caplan, 1964), or in more contemporary parlance, universal prevention in contrast to targeted prevention (Weissberg et al., 2003). At the center of current prevention research are the concepts of risk factors and protective factors (Jessor, 1993; Jessor, Turbin, & Costa, 1998; Rutter, 1987). Risk factors are individual and/or environmental markers which increase the probability of a negative outcome. Protective factors are safeguards identified in epidemiological research that help individuals cope successfully with risk. As noted by Rutter (1987), protective factors operate only when risk is present.

There are important points of overlap and of difference when comparing positive youth development with this major risk and protective factor approach to prevention. The two approaches partially agree on developmental goals. That is, both are dedicated to reducing problem behaviors and negative outcomes. At the same time, however, positive youth development tends to place as much or more focus on promoting additional approaches to health, including thriving skill-building and competency (Bumbarger & Greenberg, 2002; Pittman & Fleming, 1991). There is also some overlap in understanding the processes and mechanisms involved in the production of successful development. Some of the so-called protective factors that buffer risk and reduce negative outcomes also play a role in the production of positive outcomes (Catalano, Hawkins, Berglund, Pollard, & Arthur, 2002). Alternatively, positive youth development research also identifies a series of additional supports, opportunities, and developmental assets whose identification emerges from investigations of environmental and individual factors that promote competence, achievement, growth, and thriving (Benson, 2003a; Lerner, 2004; Scales, Benson, Leffert, & Blyth, 2000). Hence, protective factors and the broader range of developmental resources central to positive youth development are not isomorphic.

At another level, however, prevention and positive youth development are grounded in quite different theoretical orientations and—though yoked by common interest in the health of youth—spring forth from quite different visions of youth potential and the developmental, ecological, and social processes at play (Damon & Gregory, 2003; Lerner, 2004).

THE THEORY OF POSITIVE YOUTH DEVELOPMENT

A grand theory of positive youth development requires the integration of multiple theoretical orientations. In part, this is because positive youth development is a "bridging" field that touches multiple academic disciplines and spheres of practice. Three theoretical strands central to positive youth development are discussed in this section, with primary emphasis on the first. These three are: human development, community organization and development, and social and community change.

Human Development

Central to positive youth development theory is a series of questions rooted squarely in the discipline of developmental psychology. The overarching goals of this theory are to explain: the capacity of youth to change and to change in a direction that fosters both individual well-being and the social good; how and under what conditions contextual and ecological factors contribute to this change (and how these factors are informed or influenced by the developing person); and, the principles and mechanisms that are at play in maximizing the dynamic and developmentally constructive interplay of context and individual.

The articulation of a *developmental* theory of positive youth development is itself an ongoing and dynamic process emerging several decades after the birthing of positive youth development as a field of practice (Benson & Saito, 2001; Hamilton & Hamilton, 2004; Larson, 2000; Zeldin, 2000). Zeldin (2000) provides an important analysis of how the science of youth development emerged:

> [I]n hindsight, it is clear that positive youth development, as a philosophy of service and as a field of study was initiated and grounded in the expertise of practitioners, primarily those working in nonprofit, community-based, youth-serving organizations. Research was used primarily to offer "empirical justification" for exemplary practice that was already occurring in communities. (p. 3)

An important step in growing the science of positive youth development was a "call to action" made by a team of researchers and leaders of youth development organizations (Zeldin, 1995). Facilitated by the Academy for Educational Development, this 1995 document challenged academicians—particularly those engaged in the study of adolescence—to focus research on strength-based models of adolescent development, identify and study positive youth outcomes, and identify "the day-to-day developmental opportunities and supports that allow young people to become competent and compassionate individuals connected to their communities" (Zeldin, 2000, p. 3).

The "golden age" of positive youth development research began in the mid-1990s, with burgeoning literatures on topics such as civic engagement, service learning, connectedness, generosity, purpose, empowerment, and leadership. In the past few years, work positing the theoretical foundations of positive youth development has begun. This historical progression of practice, to research, to theory may not be the idealized scientific progression, but it is important here to identify how this evolutionary pattern critiques the heretofore irrelevance of developmental psychology to the massive number of people and organizations trying to innovate strength-based youth work in the United States. As Larson (2000) put it, youth development evolved separately from development psychology "partly because we psychologists have had little to offer" (p. 171). Alternatively, this progression may be an exemplar of the kind of citizen-scholar partnership needed to promote civil society (Lerner et al., 2000).

Essential to positive youth development theory is a generous view of human capacity and potential. Grounded initially in the views and values of professionals and practitioners working with youth, this vision of human nature identified the possibility of active and constructive contribution to the development of self, community, and society. As noted earlier in this chapter, such a view is often characterized in youth development circles by describing young people as resources to be nurtured versus problems to be managed. This view is an important starting point for a theory of positive youth development, for it brings to the fore the notion that the individual—and not just the environment—is a prime actor in the shaping of positive developmental trajectories.

Damon (2004), in an important essay titled "What Is Positive Youth Development" argues that this positive vision of youth potential has implications for research, education, and social policy. He also sees this human nature assumption supported by three relatively recent lines of inquiry: the research on resilience (Garmezy, 1983); the capacity of newborns to demonstrate empathy (Eisenberg & Fabes, 1998; Hoffman, 2000); and the universal capacity for moral awareness and prosocial behavior (Feshbach, 1983; Madsen, 1971). Damon also asserts that this human capacity for competence and contribution is at play when seeking to explain how young people "learn and thrive in the diverse settings where they live."

The essence of positive youth development theory is explaining how such potentiality expresses itself. The theory requires an appreciation of the dynamic interplay of person and context. Accordingly, the theory is most at home in a family of theoretical approaches constituting the large metatheory known as developmental systems theory (Ford & Lerner, 1992; Gottlieb, 1997).

This metatheory includes several crucial assumptions and components that, in combination, positions human development in relational and contextual space, and that stand in contrast to earlier developmental theories that split development into such polarities as nature-nurture, biology-culture and individual—society (Lerner, 1998; Overton, 1998).

Although positive youth development theory is predicated on key concepts in developmental systems theory, it includes several other core ideas having to do with the orchestration of bidirectional context-person relationships in order to maximize growth and development. While positive youth development can happen naturally (as in the adage that "positive youth development is what happens when families have a good day"), such adaptive development regulations (Lerner, 1998, 2004) can be encouraged and engineered by the ways contexts are designed and the ways youth are engaged in that design.

Central to the theory of positive youth development are conceptions of the developing person, the contexts in which the person is embedded and the dynamic interaction between the two. Following Lerner's lead (1984, 1998, 2002, 2003), all of the multiple levels of organizations engaged in human development—from biology and personality disposition to relationships, social institutions, culture, and history—are fused into an integrated system. Development has to do with changes in the relations among and between these multiple levels of organizations. Consonant with systems thinking in biology, persons—through their dynamic interaction with developmental contexts—experience pattern and order via the process of self-organizing. This key dynamic of self-organization means that "pattern and order emerge from the interactions of the components of a complex system without explicit instructions, either in the organization itself or from the environment. Self-organization—processes that by their own activities change themselves—is a fundamental property of living things" (Thelen & Smith, 1998, p. 564). At one level, this proposed dynamic interaction of nature and nurture is a dramatic departure from earlier models of human development which created a split between the two (Lorenz, 1965; Skinner, 1938). At another level, however, the concept of self-organization introduces, as Lerner suggested (1976, 2003) a "third source" of development: the organism itself. Schneirla's (1957, 1959) concepts of circular functions and self-stimulation were important illustrations of the organism's centrality and active participation in development.

An articulation of this point suggests that individual development cannot be explained by heredity or environment alone (Gottlieb, Wahlsten, & Lickliter, 1998). Evidence for this comes from studies where "genetically identical individuals are reared in unusually uniform environments but nonetheless differ markedly in phenotypic types" (Gottlieb et al., p. 253). While individual differences—stemming presumably from neither genes nor contexts—can be a nuisance to theorists preferring reductionist understandings of development, such so-called "noise" or "randomness" points to the "third source" of development central in developmental system theories.

Positive youth development theory includes another dynamic feature of the organism that is consonant with the process of self-organization but not readily inferred from it. And this is the concept of how persons act on their contexts. Indeed, one of the core tenets in developmental systems theory is the bidirectional nature of influences on development. That is, the "individual is both the active producer and the product of his or her ontogeny . . ." (Brandtstädter, 1998, p. 800). Action theories of human development seek to explain these dual developmental regulation processes of the action of contexts on individuals and the action of individuals on their contexts. This process by which organisms engage, interact with, and alter their developmental contexts (e.g., peer group, family, school, and neighborhood) is not only a pivotal theoretical notion for positive youth development, but is also "the essential intellectual challenge for developmental science" (Lerner, 2003, p. 228).

What processes guide how youth engage and act on their contexts? There are a series of developmental processes particularly salient during adolescence. Among these are identify formation and allied issues around self-appraisal, meaning-making, and autonomy. Because of the centrality of these issues during adolescence, positive youth development theory argues that adolescents bring particular energy to their relational and social world. Their activity—as "co-producers" of their development—is guided by three intertwined processes, each of which is rooted in theoretical traditions from within the broader "family" of developmental systems theories. Indeed, we think of these three as prime features of the "engine" of development. And in combination, the three make possible a purposeful search for positive (i.e., developmentally rich) contexts.

Brandtstädter's action theory of development emphasizes the role of *intentionality* in guiding and regulating

one's engagement with social and symbolic environments (1998, 1999). His assumption is that persons reflect on, learn from, and use feedback from their social engagements creating behavioral intentions that guide subsequent behavior. While this proposed dynamic has currency across the life span, it is a hallmark of adolescence. There are a range of possible constraints on how the person self-regulates internal engagements with her or his social and symbolic worlds. As Brandtstädter suggests "these constraints lie partly or even completely outsides one's span of control, but they decisively structure the range of behavioral and developmental options" (1998, p. 808).

In addition to *intentionality,* there are *selection* and *optimization* processes that also inform how persons interact with their environments. Aligned with Baltes and his colleagues (Baltes & Baltes, 1990; Baltes, Dittmann-Kohli, & Dixon, 1984; Baltes, Lindenberger, & Staudinger, 1998), positive youth development theory posits that youth select from a range of developmental supports and opportunities a subset that has psychological and social advantage for prioritized personal goals. Selection, then, has to do with both one's preferences (e.g., to learn to play the flute, to find friends, to experiment with drama) and the ecologies one chooses to be the primary crucibles for development. Optimization is "the process of acquiring, refining, coordinating, and applying goal-relevant means or resources" toward the selected targets (Lerner, 2002, p. 224). Critical issues in the applied youth development world include: how well communities provide meaningful opportunities for optimization; and how well communities make it possible for youth to create optimization opportunities (e.g., to begin a new sports or arts program, or to attach oneself to an appropriate mentor).

The self-regulation of context engagement—even when buoyed with an internal press guided by intentionality, selection, and optimization—creates something of a conundrum for those on whom the constraints on action appear sizable. These constraints, which are well articulated in a number of life span and life course theories (e.g., Elder, 1974, 1980, 1998, 1999; Nesselroade, 1977; Schaie, 1965), can have strong salience during adolescence. Youth, after all, both seek control and are controlled, with many agents in their lives who, by virtue of position and power, can either suppress or encourage exploration, selection, and optimization. Among this army of socialization agents are parents, neighbors, teachers, youth workers, coaches, clergy, employees, and peers. Positive youth development theory posits that adolescents will strive to find and/or create optimizing settings even when their degrees of freedom are limited. These settings may be countercultural and/or deemed by society to be out-of-bounds. This axiom is supported by the work of Heckhausen and her colleagues (Heckhausen, 1999; Heckhausen & Krueger, 1993; Heckhausen & Schulz, 1995). As in the model of selection, optimization, and compensation (Baltes & Baltes, 1990), she is concerned with the dialectic between possibility (i.e., plasticity) and constraint. She argues that "primary control" (or the process of acting on the environment in order to make it more congruent with ones needs) is a dominating human striving, particularly during adolescence and young adulthood.

Lerner (1998, 2002, 2003, 2004; Lerner, Anderson, Balsano, Dowling, & Bobek, 2003; Lerner et al., 2002) has been particularly productive and influential in connecting core ideas in developmental systems theories to the emerging field of positive youth development. His overarching view is that "changes across the life span are seen as propelled by the dynamic relations between the individual and the multiple levels of the ecology of human development (family, peer group, school, community, culture), all changing interdependently across time (history)" (Lerner et al., 2002, pp. 13–14). His thinking about three core concepts—temporal embeddedness, plasticity, and developmental regulation—is central to the formation of positive youth development theory and deepens the assumptions of person-context interactions described earlier.

Temporal embeddedness refers to the potentiality, across the entire life span, for change in person-context relations. This potentiality—yoked with our earlier discussion of the principles of self-organization and the active participation by the individual in shaping one's contexts—liberates us from the idea that biology, environment, or the combination of the two, is destiny. Positive youth development—as theory and practice—works in the optimistic arena offered by temporal embeddedness and by the *relative plasticity* (i.e., the potential for systemic change) that derives from it. That is, temporality and relative plasticity mean that, "the potential to enhance human life" always exists (Lerner et al., 2002, p. 14).

Finally, Lerner links the concept of developmental regulation to the promise of positive youth development. By so doing, he gives the theory a way to understand how individuals manage or shape their relations with

multiple contexts. Developmental systems theories derive concepts of developmental regulation from the idea of relative plasticity. As persons actively regulate their development, developmental change occurs in the mutual exchange between person and context. *Adaptive* (healthy) *developmental regulation* occurs when there is a balance between individual capacity or strengths and the "growth-promoting influences of the social world" (Lerner, 2004, p. 44).

Positive youth development, then, occurs in the fusion of an active, engaged, and competent person with receptive, supportive, and nurturing ecologies. The consequences of these balanced interactions—particularly when they are frequent and sustained—can be seen at both the individual and social level. Among these hypotheses are the advancement of individual thriving and the reduction of health-compromising behaviors (Benson, 1997; Benson et al., 1998; Lerner, 2004; Lerner & Benson, 2003; Scales, Benson, et al., 2000). A common vocabulary in positive youth development for describing these effects is the five Cs: competence, confidence, connection, character, and caring (or compassion; NRCIM, 2002; Lerner, 2004; Lerner et al., 2000; Roth & Brooks-Gunn, 2003) has written extensively about a "6th C" fueled by adaptive developmental regulations: contribution. In his frame, the six Cs are essential not only for individual well-being but also for the creation of healthy and civil society.

Several recent lines of inquiry are congruent with this thinking. The goodness-of-fit model, for example, demonstrates the adaptive consequences of good matches between individual competencies and needs with the demands, features, and responsiveness of developmental settings, such as families and schools (Bogenschneider, Small, & Tsay, 1997; Chess & Thomas, 1999; Galambos & Turner, 1999; Thomas & Chess, 1977). Similarly, Eccles and her colleagues (Eccles, 1997; Eccles & Harold, 1996), employing a stage-environment fit model, demonstrate how embeddedness in developmentally appropriate environments such as schools influences motivation and academic achievement.

As we note later in this chapter, the issue of diversity is central to positive youth development. Spencer and her colleagues (Spencer, 1995, 1999; Spencer, Dupree, & Hartmann, 1997) provide a particularly important refinement and extension of the kinds of ecological and systems dynamics shaping the theory of youth development. Central to her phenomenological variant of ecological systems theory (PVEST), Spencer uses the concept of identity formation and of how self-appraisal processes regarding one's standing in multiple contexts (e.g., schools) inform the processing of bidirectional person-context transactions. Phenomenological variant of ecological systems th, then, integrates issues of historical and cultural context (e.g., race and gender stereotypes, minority status) into normative developmental processes. This theory has been extensively utilized to understand the development of African American youth. New work is underway to understand the historical and cultural contexts informing the development of Latino/Latina youth (Rodriguez & Morrobel, 2004).

Conceptual Models of Positive Development

A series of conceptual models have emerged to identify the positive developmental experiences that enhance the fusion of person and context. A rich vocabulary has developed to describe these development-enhancing ingredients. Among these are supports, opportunities, developmental nutrients, developmental strengths, and developmental assets.

One important research-based tradition informing these conceptualizations is that of resilience. Formal inquiry into resilience, or the development of positive adaptation in the context of significant adversity (Masten, 2001), took root during the 1960s and 1970s. In an effort to better understand maladaptive behavior, psychologists and psychiatrists studied children believed to be at risk for pathology (e.g., children of a parent with schizophrenia), and observed that some children were developing normally (Masten & Coatsworth, 1998). These early efforts at understanding "invulnerables" (Werner & Smith, 1989) focused on personal qualities of the child, such as self-esteem or high intelligence (Anthony, 1974). Eventually researchers came to understand that resilience was not a trait inherent in the child, but rather was a function of the child? environment interaction. This more ecological approach led to the identification of three broad sets of protective factors implicated in fostering resilience: (1) those within a child (cognitive abilities, easy temperament); (2) within the family (organized family environment, close parent-child relationships); and (3) within the broader social ecology (effective schools, relationship with a caring adult; Luthar, Cicchetti, & Becker, 2000; Masten & Garmezy, 1985).

The primary mechanism through which resilience approaches attempt to facilitate positive development is via intervention and prevention programs. One exemplar of

this approach is Hawkins' social development model (Hawkins & Catalano, 1996). This model asserts that children who experience developmentally appropriate opportunities for active involvement in their families, schools, and communities, *and* are recognized for their efforts are more likely to form positive bonds and attachments that inhibit deviant or problem behavior (Catalano et al., 2003). According to these authors, the following salient protective factors are necessary for prevention:

Community Protective Factors

- Opportunities for prosocial community involvement
- Rewards for prosocial community involvement

School Protective Factors

- Opportunities for prosocial school involvement
- Rewards for prosocial school involvement

Family Protective Factors

- Opportunities for prosocial family involvement
- Rewards for prosocial family involvement
- Family attachment

Peer and Individual Protective Factors

- Religiosity
- Belief in a moral order
- Social Skills
- Prosocial Peer Attachment
- Resilient Temperament
- Sociability

Within the community of scholars self-identifying as youth development researchers, considerable attention has been given to defining and conceptualizing development-enhancing processes, with a growing number of publications dedicated to synthesizing the many frameworks (Benson & Saito, 2001; NRCIM, 2002; Roth & Brooks-Gunn, 2000; Small & Memmo, 2004). Several publications have been influential in guiding practice and policy. Pittman and her colleagues (Pittman, Irby, & Ferber, 2000; Pittman, Irby, Tolman, Yohalem, & Ferber, 2001) identified seven essential developmental resources: stable programs; basic care and services; healthy relationships with peers and adults; high expectations and standards; role models, resources and networks; challenging experiences and opportunities to participate and contribute; and high-quality instruction and training. Connell, Gambone, and Smith (2001) posit three major developmental resources: the ability to be productive, the ability to connect, and the ability to navigate. Zeldin (1995; Zeldin, Kimball, & Price, 1995) identifies access to safe places, challenging experiences, and caring people.

The concept of developmental assets emerged in 1990 (Benson, 1990, 1997, 2002, 2003a) and has triggered considerable research and a community change process used in 700 cities in the United States and Canada. The framework of developmental assets (see Table 16.1) is a theory-based model linking features of ecologies (external assets) with personal skills and capacities (internal assets), guided by the hypothesis that external and internal assts are dynamically interconnected "building blocks" that, in combination, prevent high risk health behaviors and enhance many forms of developmental success (i.e., thriving).

As described in a series of publications (Benson, 1997, 2002; Benson et al., 1998), the framework establishes a set of developmental experiences and supports that are hypothesized to have import for all young people during the 2nd decade of life. However, it has also been hypothesized that developmental assets reflect developmental processes that have age-related parallels in infancy and childhood (Leffert, Benson, & Roehlkepartain, 1997; Mannes, Benson, Kretzmann, & Norris, 2003; Scales, Sesma, & Bolstrom, 2004).

The framework synthesizes research in a number of fields with the goal of selecting for inclusion those developmental resources that: (a) have been demonstrated to prevent high risk behavior (e.g., substance use, violence, dropping out of school), enhance thriving, or build resilience; (b) have evidence of generalizability across social locations; (c) contribute balance to the overall framework (i.e., of ecological and individual-level factors); and (d) for which it can be demonstrated that communities have the capacity to effect their acquisition.

Because the model, in addition to its theoretical and research purposes, "is also intended to have practical significance for mobilizing communities" (Benson, 2002, p. 127), the assets are placed in categories that have conceptual integrity and that can be described easily to the people of a community. They are grouped into 20 external assets (health-promoting features of the environment) and 20 that are internal (skills, values, competencies, and self-perceptions). The external assets are grouped into four categories: (1) support, (2) empowerment, (3) boundaries and expectations, and (4) constructive use of time. The

TABLE 16.1 The Framework of Developmental Assets

Category	External Assets	Definition
Support	1. Family support	Family life provides high levels of love and support.
	2. Positive family communication	Young person and her or his parent(s) communicate positively, and young person is willing to seek advice and counsel from parents.
	3. Other adult relationships	Young person receives support from three or more nonparent adults.
	4. Caring neighborhood	Young person experiences caring neighbors.
	5. Caring school climate	School provides a caring, encouraging environment.
	6. Parent involvement in schooling	Parent(s) are actively involved in helping young person succeed in school.
Empowerment	7. Community values youth	Young person perceives that adults in the community value youth.
	8. Youth as resources	Young people are given useful roles in the community.
	9. Service to others	Young person serves in the community one hour or more per week.
	10. Safety	Young person feels safe at home, school, and in the neighborhood.
Boundaries and expectations	11. Family boundaries	Family has clear rules and consequences and monitors the young person's whereabouts.
	12. School boundaries	School provides clear rules and consequences.
	13. Neighborhood boundaries	Neighbors take responsibility for monitoring young people's behavior.
	14. Adult role models	Parent(s) and other adults model positive, responsible behavior.
	15. Positive peer influence	Young person's best friends model responsible behavior.
	16. High expectations	Both parent(s) and teachers encourage the young person to do well.
Category	**Internal Assets**	**Definition**
Commitment to learning	21. Achievement motivation	Young person is motivated to do well in school.
	22. School engagement	Young person is actively engaged in learning.
	23. Homework	Young person reports doing at least one hour of homework every school day.
	24. Bonding to school	Young person cares about her or his school.
	25. Reading for pleasure	Young person reads for pleasure three or more hours per week.
Positive values	26. Caring	Young person places high value on helping other people.
	27. Equality and social justice	Young person places high value on promoting equality and reducing hunger and poverty.
	28. Integrity	Young person acts on convictions and stands up for her or his beliefs.
	29. Honesty	Young person "tells the truth even when it is not easy."
	30. Responsibility	Young person accepts and takes personal responsibility.
	31. Restraint	Young person believes it is important not to be sexually active or to use alcohol or other drugs.
Social competencies	32. Planning and decision making	Young person knows how to plan ahead and make choices.
	33. Interpersonal competence	Young person has empathy, sensitivity, and friendship skills.
	34. Cultural competence	Young person has knowledge of and comfort with people of different cultural/racial/ethnic backgrounds.
	35. Resistance skills	Young person can resist negative peer pressure and dangerous situations.
	36. Peaceful conflict resolution	Young person seeks to resolve conflict nonviolently.

(continued)

TABLE 16.1 *Continued*

Category	External Assets	Definition
Positive identity	37. Personal power	Young person feels he or she has control over "things that happen to me."
	38. Self-esteem	Young person reports having high self-esteem.
	39. Sense of purpose	Young person reports that "my life has a purpose."
	40. Positive view of personal future	Young person is optimistic about her or his personal future.

Source: From *All Kids Are Our Kids: What Communities Must Do to Raise Caring and Responsible Children and Adolescents,* by P. Benson, 1997, San Francisco: Jossey-Bass.

internal assets are placed in four categories: (1) commitment to learning, (2) positive values, (3) social competencies, and (4) positive identity. The scientific foundations for the eight categories and each of the 40 assets are described in a series of publications (Scales & Leffert, 1999, 2004; Scales et al., 2004).

The 2002 report from The National Research Council and Institute of Medicine, *Community Programs to Promote Positive youth Development* (NRCIM, 2002), used the concept of assets to describe the experiences, supports, and opportunities "which facilitate both successful passage through" adolescence and "optimal transition into the next phase of life—adulthood" (p. 67). Parallel to Search Institute's distinction between external and internal assets, this national report used the language of "personal" and "social" assets. The authors used three types of empirical studies to identify assets: "studies linking the personal and social assets to indicators of positive current development, studies linking these characteristics to indicators of future positive adult development, and experimental studies designed to change the asset under study" (p. 82).

The committee of scholars charged with creating this report then identified 28 personal and social assets. Unlike Search Institute's developmental asset taxonomy, the 28 indicators are all personological in nature and do not include the same balance of contextual factors and individual-level factors. Nonetheless, there is considerable overlap between the two taxonomies. Table 16.2 displays the NRCIM taxonomy of personal and social assets. It should be noted, however, that the committee also created a conceptual model of the "features of positive developmental settings." These provide some parallel thinking to the concept of external assets. These "features" will be discussed in the next section.

Embedded in both the developmental asset model and the National Research Council report are three explicit hypotheses, each of which will be evaluated later in this chapter. The first has to do with the additive or cumulative nature of the elements called assets. The assumption is that "the more assets, the better." The National Research Council Report frames it this way: "adolescents with more personal and social assets . . . have a greater chance of both current well-being and future success" (NRCIM, 2002, p. 42). Benson and his colleagues (Benson, 2003a; Benson et al., 1998; Benson, Scales, & Mannes, 2003) refer to the longitudinal expression of this principle as the "vertical pile up" of assets. Both streams of thought also contend that this principle of accumulated assets generalizes to multiple forms of behavior—from prevention of high risk behavior to the enhancement of positive outcomes such as school success (Benson et al., 2003; NRCIM, 2002; Scales & Roehlkepartain, 2003).

Closely related is the idea of the "pile up" of supportive contexts. That is, positive development is also enhanced when many settings collaborate—whether intentional or not—in generating the kinds of supports and opportunities known to promote assets. In the words of the National Research Council (2002),

> Research shows that the more settings that adolescents experience reflecting these features, the more likely they are to acquire the personal and social assets linked to both current and future well-being. (p. 43)

Scales and Roehlkepartain (2004) have recently called this the principle of "horizontal pile up." This concept is similar to the idea of developmental redundancy (Benson, 1997; Benson et al., 1998). Recent work in the sociology of adolescence also speaks to this dynamic (Furstenberg, 2000).

A second hypothesis addresses the nature of assets as relevant universally, although often experienced or expressed differently across diversities. Among youth development scholars, it is commonly assumed that the elements in the conceptual models of nutrients/

TABLE 16.2 Personal and Social Assets That Facilitate Positive Youth Development

Physical development:
- –Good health habits
- –Good health risk management skills

Intellectual development:
- –Knowledge of essential life skills
- –Knowledge of essential vocational skills
- –School success
- –Rational habits of mind—critical thinking and reasoning skills
- –In-depth knowledge of more than one culture
- –Good decision-making skills
- –Knowledge of skills needed to navigate through multiple cultural contexts

Psychological and emotional development:
- –Good mental health including positive self-regard
- –Good emotional self-regulation skills
- –Good coping skills
- –Good conflict resolution skills
- –Mastery motivation and positive achievement motivation
- –Confidence in one's personal efficacy
- –"Planfulness"—planning for the future and future life events
- –Sense of personal autonomy/responsibility for self
- –Optimism coupled with realism
- –Coherent and positive personal and social identity
- –Prosocial and culturally sensitive values
- –Spirituality or a sense of a "larger" purpose in life
- –Strong moral character
- –A commitment to good use of time

Social development:
- –Connectedness—perceived good relationships and trust with parents, peers, and some other adults
- –Sense of social plane/integration—being connected and valued by larger social networks
- –Attachment to prosocial/conventional institutions, such as school, church, nonschool youth programs
- –Ability to navigate in multiple cultural contexts
- –Commitment to civic engagement

Source: From *Community Programs to Promote Youth Development: Committee on Community-Level Programs for Youth,* by the National Research Council and Institute of Medicine, J. Eccles and J. A. Gootman (Eds), Board on Children, Youth and Families, Division of Behavioral and Social Sciences and Education, 2002, Washington, DC: National Academy Press.

resources/assets have currency for youth in all social locations. This claim is particularly clear in both the National Research Council report and the research undergirding the developmental asset model. At the same time, however, both models testify to the diversity of methods and procedures for promoting assets, and to the importance of creating strategies of asset-building that are crafted with deep sensitivity to the experience, wisdom and capacity of people within particular racial, ethnic, religious, and economic groups (Hamilton et al., 2004).

The third assumption is one that arguably is the strongest point of theoretical consensus across scholars, research programs, and practitioners within the positive youth development field. This is the belief that assets are enhanced when contexts and settings are configured

and organized in specific ways. Context matters and contexts can be changed. This principle can be succinctly stated as:

> personal and social assets are enhanced by positive developmental settings. (NRCIM, 2002, p. 43)

Not surprisingly, then, there is a considerable research tradition on how, and under what conditions, contexts and ecologies promote positive development. This body of work shifts the unit of analysis from the person to contexts, environments, and communities. Accordingly, it draws us into a number of fields beyond developmental psychology in which such inquiry is more at home. We suggest that a theory of person, context, and their intersection such as suggested earlier in this chapter is a necessary but not sufficient set of ideas for delineating the territory, scope, and uniqueness of positive youth development. The major lacuna in our discussion to this point is the idea of intentional change. At the heart of positive youth development thinking and research is the question of how the healthy/balanced/adaptive fusion of person and context can be enhanced. It is this idea—this possibility of creating change—that has fueled practice for several decades and, more recently, is fueling research and policy.

A theory of positive youth development, then, is incomplete without incorporating the concept of intentional change. Without doing so, we have a theory of adolescent development—not positive youth development. Intentional change is the purposeful effort to enhance the fusion of person and context in a healthy direction. Because of the dynamic bidirectionality of this interaction, there are three major points of potential intervention. The three of these, in combination, increase the probability of adaptive developmental regulation. These are:

1. *Increasing the developmental-attentiveness of contexts* (to increase their capacity to nurture, support, and constructively challenge the developing person).
2. *Enhancing the skills and competencies of youth* (to further enable their "natural" capacity to engage with, connect, change, and learn from their social contexts).
3. *Creating processes and opportunities to invite youth to actively exercise and utilize their capacity* to engage with and change their social contexts. In practice and research, this form of intentional change travels under such concepts as youth leadership, service learning, youth empowerment, and youth engagement.

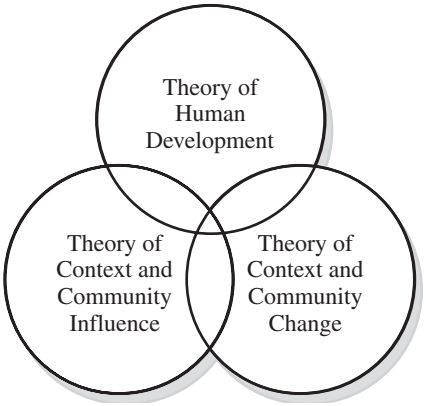


Figure 16.2 A comprehensive theory of positive youth development.

A comprehensive approach to positive youth-development requires the integration of three theories: of human development (which is the primary focus of this chapter), of context and community influence, and of how contexts and communities change. These three are displayed in Figure 16.2.

The Theory of Context and Community Influence

There is an extensive and growing literature on the features and dynamics of developmentally supportive contexts. It is here that we reference the major contributions of Bronfenbrenner (1979; Bronfenbrenner & Morris, 1998). His ecological theory of development has been instrumental in shaping the theory, research, and practice of positive youth development. If we were to posit the canon of youth development, the list would begin with *The Ecology of Human Development* (1979). In this work, he provides a highly influential definition that not only supports a critical notion in current developmental systems theory but also shaped a generation of scholarship. In his words:

> The ecology of human development involves the scientific study of progressive, mutual accommodation between an active, growing human being and the changing properties of the immediate settings in which the developing person lives, as this process is affected by relations between these settings, and by the larger contexts in which the settings are embedded. (p. 21)

Among Bronfenbrenner's many contributions is his conceptual formulation of the nature and dynamics of developmental contexts. He portrays the nested systems that influence development as interdependent; their influence is interactive; none stands or has its effects alone. What happens in a microsystem, such as a classroom, is influenced by tax policies and by the media, but those elements of the macrosystem are themselves interpreted through and influenced by microsystems. An important implication for youth development is that effective efforts to enhance assets must change more than one system and level of system. Changing schools or even families will be less effective than changing multiple systems (or settings).

Wynn (1997) and her colleagues conceive of the community institutions influencing youth development as "sectors" and focus on "primary supports" as a strong but under-appreciated influence. Primary supports are voluntary; youth choose to participate and make choices about what they will do and how. Primary supports afford young people opportunities to take initiative and to participate actively, in contrast to the passivity characterizing the role of student. Exemplars of primary supports include "arts and after school programs; organized sports; community service and youth entrepreneurship opportunities; and the offerings of parks, libraries, museums, and community centers" (p. 1).

Consistent with Bronfenbrenner's idea of the importance of links among systems, Wynn (1997) claims that primary supports function best when they reinforce and link other sectors, especially families, schools, healthcare, and other services. Critical to effective primary supports are: high expectations; group problem solving; concrete products and performances; prospects for advancement and expanded opportunities; adults acting as caregivers, catalysts and coaches; membership; availability and continuity; respect and reciprocity; and adult investment (pp. 5–7).

There are a growing number of such conceptual models for identifying developmental contexts that are potential sources for positive youth development (see, e.g., Benson & Saito, 2001; Benson et al., 2003; Gambone, Klem, & Connell, 2002; Hamilton & Hamilton, 2004; Pittman et al., 2000). An important line of theory and research is also emerging to explain how, and under what conditions, such contexts inform positive development. Several themes are particularly central to positive youth development theory. Bronfenbrenner and Morris (1998) identify two of these themes. Development occurs as a person interacts with "people, objects and symbols" in what they call "proximal processes," which are "the primary engines of development" (p. 996). Caring relationships are critical, not only in the family, but in all the settings youth occupy. Likewise, youth need a range of challenging activities in multiple settings. Both the people and the activities foster development best when they provide an optimum balance of challenge and support. According to Bronfenbrenner and Morris, the most powerful activities and relationships are predictable and enduring.

The classic account of how relationships promote development and learning is Vygotsky's (1978) "zone of proximal development." According to Vygotsky, development, in the sense of growing competence, occurs when the developing person is assisted by someone who is already competent in accomplishing tasks she or he cannot do unaided. With experience, this assistance becomes unnecessary and the person can perform independently. Several cognitive scientists have elaborated this notion, using the metaphor of "scaffolding" that is gradually withdrawn (e.g., Bruner, 1983; Rogoff, 1990). Although the metaphor is faulty (implying that scaffolding holds up a building until it is capable of standing on its own), the idea is sound: the assistance of someone who is more advanced enables youth to gain competence, especially if that person is skilled at knowing when to help and when not to. Bronfenbrenner (1979), acknowledging Vygotsky, hypothesized that:

> Learning and development are facilitated by the participation of the developing person in progressively more complex patterns of reciprocal activity with someone with whom that person has developed a strong and enduring emotional attachment and when the balance of power gradually shifts in favor of the developing person. (p. 60)

Benson et al. (2003) enumerated five aspects of relationships germane to positive youth development. First, supportive relationships with both immediate and extended family members have been shown, in multiple studies and multiple demographic settings, to enhance developmental strengths and provide a protective buffer against risk (Rhodes & Roffman, 2003). Second, supportive relationships with nonparental adults can be equally compelling in advancing positive development, particularly during adolescence (Scales, Benson, & Mannes, 2002; Scales & Leffert, 2004; Scales, Leffert, & Vraa, 2003). Third, the number of supportive adult relationships may provide an additive impact: As the

number of nurturing relationships increase, probabilities for the presence of developmental strengths such as caring values, self-esteem, and a positive view of one's future also may increase (Benson, 1997). An additional axiom about nonparental adults has to do with the sustainability of relationships. It is reasonable to hypothesize that the strength-building capacity of nonparental adult connections increases proportionately with the length of the relationship.

Fourth, exposure to positive peer influence—defined, for example, as peer modeling of prosocial and achievement values—can both advance developmental strengths and inhibit risk behaviors (Leffert et al., 1998; Scales, Benson, et al., 2000). Finally, the developmental advantage of relationships is enhanced by three factors: their quality, their quantity, and their sustainability.

The second theme identified by Bronfenbrenner and Morris (1998) has to do with the importance and certainty of activity. Csikszentmihalyi (1990) has compellingly made the case that certain kinds of activities instigate development in his work on "flow" or "the psychology of optimal performance." Csikszentmihalyi has documented the phenomenon of flow in people like rock climbers, dancers, and others who engage in highly challenging activities that reward them with a sense of successfully negotiating challenges that require intense concentration. This work helps to explain why some activities contribute more to building youths' assets than others. Activities such as playing chess, playing a musical instrument, or planning and carrying out a community service project build developmental assets more than watching television or gossiping with friends.

In another important statement of how activity contributes to positive development, Larson (2000) posits that the development of initiative is critical. Combining intrinsic motivation and deep attention, initiative can emerge from well-designed structured activities within sports, arts, and related youth development programs.

The themes of relationships and developmentally appropriate activity are "front and center" in most conceptual models seeking to describe the essential features of positive developmental contexts (Gambone & Arbreton, 1997; McLaughlin, Irby, & Langman, 1994; Quinn, 1999; Roth & Brooks-Gunn, 2000, 2003). In a synthesis of this research, NRCIM (2002) identified eight features of programs, hypothesized to "expand the opportunities for youth to acquire personal and social assets" (p. 8). These are listed in Table 16.3. As noted earlier, these

TABLE 16.3 Features of Positive Developmental Settings

Feature	Descriptors
Physical and psychological safety	Safe and health-promoting facilities, practice that increases safe peer group interaction and decreases unsafe or confrontational peer interactions
Appropriate structure	Limit setting, clear and consistent rules and expectations, firm-enough control, continuity and predictability, clear boundaries, and age-appropriate monitoring
Supportive relationships	Warmth, closeness, connectedness, good communication, caring, support, guidance, secure attachment, and responsiveness.
Opportunities to belong	Opportunities for meaningful inclusion, regardless of one's gender, ethnicity, sexual orientation or disabilities; social inclusion, social engagement and integration; opportunities for sociocultural identity formation; and support for cultural and bicultural competence
Positive social norms	Rules of behavior, expectations, injunctions, ways of doing things, values and morals, and obligations for service
Support for efficacy and mattering	Youth-based, empowerment practices that support autonomy, making a real difference in one's community, and being taken seriously; practices that include enabling, responsibility granting, and meaningful challenge; practices that focus on improvement rather than on relative current performance levels
Opportunity for skill building	Opportunities to learn physical, intellectual, psychological, emotional, and social skills; exposure to intentional learning experiences; opportunities to learn cultural literacies, media literacy, communication skills, and good habits of mind; preparation for adult employment and opportunities to develop social and cultural capital
Integration of family, school, and community efforts	Concordance; coordination and synergy among family, school and community.

Source: From *Community Programs to Promote Youth Development: Committee on Community-Level Programs for Youth,* by the National Research Council and Institute of Medicine, J. Eccles and J. A. Gootman (Eds), Board on Children, Youth and Families, Division of Behavioral and Social Sciences and Education, 2002, Washington, DC: National Academy Press.

eight features of positive development settings have some conceptual overlap with the external assets in the developmental asset framework (Benson, 1997; Benson et al., 2003; Scales & Leffert, 1999, 2004).

The theory of positive youth development posits that development is enhanced when contexts are configured and organized in ways consonant with these developmental principles. As already suggested, closely aligned with the "contexts can be changed" axiom is the principle of "horizontal pile-up." This latter concept refers to the reinforcing, simultaneous experience of ecological assets across the different context of a young person's total ecology, such as family, neighborhood, school, peer group, after-school programs, and other co-curricular organizations. As suggested by Benson et al. (2003):

> Such multiple and redundant exposure to developmentally rich ecologies fortifies the social space within which young people can perceive themselves to be safe, supported and capable. Young people who experience such redundancy ought to be even more likely than young people without such a horizontal pile-up of assets to enjoy protection from risk and to thrive. (p. 387)

This idea of "developmental redundancy" helps to fuel an additional and important concept in positive youth development: the viability of community as a setting for generating both ecological and internal assets. This question of how communities inform development has become a vibrant area of inquiry (Benson et al., 1998; Blyth, 2001; Booth & Crouter, 2001; Comer, 1980; Comer, Haynes, Joyner, & Ben-Avie, 1996; Connell et al., 2001; Earls & Carlson, 2001; Hughes & Curnan, 2000; Kretzmann & McKnight, 1993; Mannes et al., 2003; Sampson, 2001; Spencer, 2001).

Using community as a unit of analysis, researchers have posited a number of community processes and dynamics inferred to be important for creating the kinds of relationships and developmentally rich contexts that promote positive development. Scales and his colleagues (Scales et al., 2001, 2002, 2003) identify pro-child social norms in which engagement with children and adolescents is expected and supported. Some theorists posit the viability of shared ideals and expectations that unite multiple socializing systems in common purpose (Benson, 1997; Damon, 1997). Zeldin (2002) points to the role of adults' sense of community as an important precursor to engagement with youth. And several identify the role of strategic alignment among community services delivery systems (Dorgan & Ferguson, 2004; Dryfoos, 1990; Mannes et al., 2003).

The construct of social capital elucidates why community mobilization is important and points to some avenues for action. Coleman (1990, p. 304) describes social capital as contained in human relationships. Human capital includes a person's competencies. Just like human capital and financial capital, social capital makes it possible for people to be productive, to accomplish tasks. Coleman points out that social capital is greater in social networks with a high degree of "closure," meaning that many people know each other, communicate, and trust each other (pp. 319–320).

Sampson and his colleagues (Sampson, 2001; Sampson, Morenoff, & Earls, 1999; Sampson, Raudenbush, & Earls, 1997) have identified community mechanisms that facilitate the generation of social capital. Chief among these is the idea of collective efficacy, which signifies "an emphasis on shared beliefs in a neighborhood's conjoint capability for action to achieve an intended effect, and hence an active sense of engagement on the part of residents" (Sampson, 2001, p. 10). Benson and his colleagues (Benson, 1997; Benson et al., 1998) have suggested that one important source of collective efficacy is a shared community vocabulary of developmental assets aligned with a publicly shared understanding of the capacity of social contexts to effect their acquisition.

The Theory of Context and Community Change

The third formulation in a comprehensive theory of positive youth-development focuses on the processes, strategies, and tactics that can directly or indirectly alter contexts and community. This is the least developed of the three theoretical foundations of the theory we envision. One recent review of the science on "how change occurs" has argued that a compelling question emerging from new discoveries about the dynamic and bidirectional sources of positive development has to do with:

> the processes and procedures of increasing access to developmental nutrients/assets on a rather massive scale. And truth be told, though all architects of developmental nutrient models are deeply interested in application, the science of how change occurs is in its infancy. We have invested much more intellectual and research energy in naming the positive building blocks of development and demonstrating their predictive utility for enhancing health and academic outcomes than in studying the complex

> array of strategies and procedures for moving the developmental needle forward. (Benson, 2003b, p. 214)

Thinking about such change is a complex enterprise. Because positive youth-development has a pronounced interest in application, a comprehensive theory of change is needed to guide both research and the change-making efforts already underway in hundreds of communities, organizations, and systems. Tying this theory and research agenda to the previous section on context and community influences suggests some of the concepts hypothesized to be central to this inquiry. Among these are building shared vision; activating collective and personal efficacy; promoting social trust; reframing how citizens view youth; mobilizing adult-youth relationships; creating effective cross-sector collaborations; and enhancing relationships and developmentally appropriate activities within socializing systems and programs.

Many points of entry into this complex arena of change have been proposed. Among these are social policy (Blum & Ellen, 2002; Halfon, 2003); social norms (Scales et al., 2003); community building (Hyman, 2002; Mannes et al., 2003); schools (Gambone et al., 2002); neighborhoods (Sampson, 2001); families (Simpson & Roehlkepartain, 2003); the mobilization of adults as change activists (Rhodes & Roffman, 2003); and the mobilization of youth as change activists (Earls & Carlson, 2002).

Recently, two conceptual frames have been proposed to help guide theory and research on change. First, Granger (2002) suggested two overarching constructs: intervention strategies to enhance the *will* to change and intervention strategies to enhance the *capacity* to change. For the latter, he posits five key strategies: human capital creation, redistribution strategies, investment strategies, social capital creation, and efficiency strategies.

Second, Benson et al. (2003) proposed five interlocking spheres of intervention. Grounded in organizational systems theory, this model suggests that change in any one sphere impacts each of the others. This assertion bears theoretical affinity with core tenets in developmental systems theory. This five-fold model is in the service, theoretically, of creating a "developmentally attentive community" (p. 389). Such a community is envisioned as one that marshals and activates the asset-building capacity of its residents (both adults and youth), and sectors (family, neighborhoods, schools, youth organizations, laces of work, congregations). A developmentally attentive community is also characterized by indirect influences that support and sustain these more direct resident and sector influences. These influences include policy, financial resources, and social norms that promote adult engagement with the young (Scales et al., 2001, 2003).

In turn, Benson et al. (2003) propose that the strategic targets for such communities are *vertical pileup* (in which youth develop many developmental assets), *horizontal pileup* (in which youth experience asset-building in multiple contexts), and *developmental breadth* (extending, by purpose and design, the reach of asset-building energy to *all* children and adolescents, not only those judged to be at "risk" and served by traditional "prevention" programs).

Accordingly, the five synergistic strategies they posit for community change are:

1. *Engage adults:* Community adults build sustained, asset-building relationships with children and youth, both within and beyond family.
2. *Mobilize youth engagement:* Adolescents use their asset-building capacities with peers and with younger children and in activities that help enhance the quality of their community.
3. *Activate sectors:* Families, neighborhoods, schools, congregations, and youth organizations activate their asset-building potential.
4. *Invigorate programs:* A community infrastructure of quality early childhood, after-school, weekend, and summer programs is available and used by children and youth.
5. *Influence civic decisions:* Financial, leadership, media, and policy resources are mobilized to support and sustain the transformation needed for areas 1, 2, 3, and 4 to emerge.

RESEARCH SUPPORT FOR KEY POSITIVE YOUTH DEVELOPMENT HYPOTHESES

The theory and practice of positive youth development suggests several of key hypotheses. Later in this section, we introduce and examine empirical support for seven hypotheses, and offer perspectives on the implications of these principles both for understanding and promoting positive youth development. Here, however, it is important to provide an overview of the nature and power of the research base pertinent to these hypotheses.

Overview of Positive Youth Development Research

The research base supporting these hypotheses is plentiful, although uneven. The literature measuring developmental resources is typified by variable-centered methods, a focus on isolated variables, use of cross-sectional samples, and linear-additive theory and analytic strategies. What is needed are person-centered methods, a focus on patterns or clusters of variables, use of longitudinal samples, and dynamic nonlinear theory and analytic strategies (Lerner, Lerner, De Stefanis, & Apfel, 2001).

Developmental outcomes for youth also encompass processes that are as important as if not more important than outcomes reflecting status points in time (e.g., current use of alcohol, how much community service one contributes). Processes include reorganization (Sroufe, 1979), being able to permanently make transitions (Baltes & Freund, 2003), and being on a path to a hopeful future (Lerner et al., 2002; Scales & Benson, 2004). Status outcomes may not adequately capture the nested interactions of person and contexts over time, for example, person-family and family community (Lerner, Freund, De Stefanis, & Habermas, 2001).

Further, the literature says relatively little about the interaction of the combination of nutrients or resources young people experience. Most studies focus on just a handful of assets (especially parental/family assets and school orientation assets, with some emphasis on peers, and more recently, on extracurricular and positive youth development program activities), and at best, how this handful may interact.

We illuminate the research support for the positive youth development hypotheses by focusing on a small number of outcomes for which positive youth development theory is best explicated, and that appear to have strong research bases and broad constituencies of researchers, practitioners, and policymakers dealing with them: Alcohol and other drug use; violence/anti-social behavior; school success; and civic engagement. Much but not all of the research cited herein pertains to those four exemplar outcomes.

How Much Explanatory Power Is Reasonable to Expect?

Hundreds of studies, cited in this chapter and in comprehensive reviews (Scales & Leffert, 2004; Scales et al., 2004), provide *persuasive* evidence (Miller & Thoresen, 2003) for the broad theoretical connection between developmental assets and developmental outcomes, both concurrently and longitudinally. This is especially true when considering as an independent variable the cumulative number of assets young people experience, or comparing those young people with relatively higher and lower levels of assets.

There is relative persuasiveness and consistency of positive findings in the literature on the explanatory power of positive youth development concepts. But what level of explanation is reasonable to expect developmental assets or nutrients to provide for complex outcomes? Luthar et al. (2000), for example, observe that studies whose findings rest on main effects often report effects of 10% to 20% for individual protective factors. When interaction effects are necessary to explain the workings of such assets, effect sizes are far smaller, in the 2% to 5% range. With both advocacy and empirical work in recent years reflecting a shift from merely documenting the impact of developmental nutrients to studying the processes and interactions that suggest *how* those nutrients contribute to outcomes (Collins, Maccoby, Steinberg, Heatherington, & Bornstein, 2000; Davey, Eaker, & Walters, 2003; Luthar et al., 2000), it may be expected that the size of many reported effects will be disappointingly, but understandably, limited.

Ecological and developmental systems theory have become the predominant frames of theoretical reference for the study of child and adolescent development (Lerner et al., 2002). Moreover, individual development and broader community and social change processes increasingly are linked in positive youth development frameworks (Benson et al., 1998, 2003; Connell & Kubisch, 2001; Hawkins & Catalano, 1996). These theoretical formulations imply that effects derived from studies shaped by those theories and frameworks may be quite modest, a conclusion supported in a recent review by Wandersman and Florin (2003). All these factors make it quite challenging scientifically to capture broad community change in the service of positive youth development (Berkowitz, 2001).

With the preceding comments providing perspective on the state-of-the-art in positive youth development research, we turn now to illustrating the evidence for each of the major positive youth development hypotheses, we can derive from our prior discussion of the theoretical and practitioner bases of the concept of positive youth development.

Hypothesis One

The first hypothesis is termed the contextual change hypothesis, and consists of two assumptions. First, contexts can be intentionally altered to enhance developmental success. And second, changes in these contexts change the person.

There is abundant evidence that ecological contexts can be changed to promote positive youth development, as well as a wealth of data about why such approaches have those positive effects. In most of this research, researchers have documented (usually, but not always) the efficacy of intervention or prevention programs in providing youth with experiences that facilitate developmental outcomes. For example, from their review of 60 evaluations of youth development programs, Roth, Brooks-Gunn, Murray, and Foster (1998) concluded:

> [Y]outh development programs are best characterized by their approach to youth as resources to be developed rather than as problems to be managed, and their efforts to help youth become healthy, happy, and productive by increasing youths' exposure to the external assets, opportunities and supports. (p. 427)

The Social Development Research Group at the University of Washington conducted one of the most wide-ranging reviews of positive youth development programs (Catalano et al., 2004). They identified 161 programs and discussed in detail 25 that were well-evaluated and showed significant effects on behavioral outcomes. The programs had to have one or more of the following objectives about building developmental assets or nutrients: Promote bonding; foster resilience; promote social competence; promote emotional competence; promote cognitive competence; promote behavioral competence; promote moral competence; foster self-determination; foster spirituality; foster self-efficacy; foster clear and positive identity; foster belief in the future; provide recognition for positive behavior; provide opportunities for prosocial involvement; and foster prosocial norms. In addition, the programs had to address either multiple assets, or a single nutrient but across the multiple social domains of family, school, or community. Programs that addressed only a single asset in a single domain were excluded. Competence, self-efficacy, and prosocial norms were addressed in all 25 programs, and most programs dealt with at least 8 of the 15 nutrients. Most programs used positive outcome measures as well as reduction of problem behavior in their evaluations. Nineteen of the 25 programs demonstrated significant effects on positive youth development outcomes, including improvements in interpersonal skills, quality of peer and adult relationships, self-control, problem solving, cognitive competence, self-efficacy, commitment to school, and academic achievement. In addition, 24 of the 25 showed significant reductions in problem behaviors such as alcohol and other drug use, school problems, aggressive behavior, violence, and risky sexual behavior.

In a review of more than 1,200 studies of outcomes in prevention programs for children and adolescents, Durlak (1998) identified eight common protective factors across programs successful in preventing behavior problems, school failure, poor physical health, and pregnancy among young people: Social support; personal and social skills; self-efficacy; good parent-child relationships; positive peer modeling; high quality schools; effective social policies; and positive social norms. The resilience literature also suggests from the finding of "synchronous evidence" from multiple studies using differing measurements, that there are three critical kinds of protective factors: Close relationships with caring, supportive adults, often in primary care-giving roles; effective schools; and positive relationships with prosocial adults in the wider community (Luthar et al., 2000).

In a meta-analysis of 177 primary prevention programs designed to prevent behavioral and mental health problems among children and adolescents, Durlak and Wells (1997) reported that most kinds of primary prevention programs (whether person- or environment-centered, and whether universal or targeted) contributed both to reducing problems and increasing competencies. However, only 15% of these programs attempted to change children's environments, despite the emphasis of context in the major developmental systems and ecological theories that are the foundation of the positive youth development field.

Developmental theories suggest that, because of the fusion of person and context, variations or alterations in developmental context should be associated with variations or alterations in developmental outcomes. For example, theories regarding the development of anti-social behavior and violence typically posit several differing trajectories. Children who are chronically high in anti-social behavior from childhood through adolescence, for example, are seen as having biological or genetic vulnerabilities that manifest themselves in attention and concentration problems, which are associated both with early school failure and peer rejection (Moffitt, 1993). Poor parenting may also contribute to this pathway.

Those developing higher levels of antisocial behavior later in childhood or adolescence are seen as being influenced more by association with deviant peers (Dishion, Andrews, & Crosby, 1995; Patterson, Reid, & Dishion, 1992). A study of several hundred urban, mostly African American males followed from first grade through seventh grade found evidence supporting such differing pathways (Schaeffer, Petras, Ialongo, Poduska, & Kellam, 2003). Theoretically then, it is plausible that early efforts to improve family related assets, social competencies, and school success all could have an ameliorative effect on the development of antisocial behavior trajectories. Indeed, Furlong, Paige, and Osher (2003) note such evidence findings linking violence prevention with children's connection to caring adults, social/emotional skills, and appropriate instruction and academic supports that promote a sense of competence and school success.

Similarly, in a study of school success, Gutman, Sameroff, and Eccles (2002) showed that developmental assets may have both a promotive (helpful for all youth) and a protective function (helpful for some youth under conditions of risk). In their study of more than 800 seventh-grade African American students, these researchers found that consistent discipline and parental school involvement were related to higher GPAs and better attendance for all youth, but not to math test scores. Peer support was a helpful resource, but only for math test scores, and then only for students who also were exposed to multiple risks such as low maternal education and family income. Parent promotion of democratic decision making was related to higher GPAs and math test scores for students who experienced multiple risks, but it was high-risk students whose parents did *not* promote democratic decision making who had the greater school success. The researchers reasoned that parents adapt their parenting practices to the risk level of the environment, with greater parental control more beneficial when children are living in high-risk environments.

In a study of high school students, McLellan and Youniss (2003) used the framework of identity development theory to describe the developmental role played by different kinds of community service, that is, differing service contexts. In their view, service provides access to different "transcendent systems of meaning" that enable young people to connect themselves with historical, religious, ethnic, or political traditions "of which they can legitimately feel a part" (p. 57). Young people were more likely to volunteer if they were in networks in which their parents and friends did service, and if they were connected to youth organizations and religious institutions. That is, service was less an individual and spontaneous act and more the result of a web of asset-building relationships and norms that together elevated service to a shared social expectation.

One of the most impressive studies illustrating the power of changed contexts on personal change and developmental success is the evaluation of Big Brothers/Big Sisters conducted by Public/Private Ventures (Tierney, Grossman, & Resch, 1995). The investigators fashioned a true experiment by randomly assigning half of those awaiting placement to a delayed-treatment control group while seeking placements for the other half. Those in the treatment group demonstrated several advantages over the control group, including lower likelihood of beginning to use drugs and alcohol or to have hit another person, along with better attitudes toward school, better grades, and attendance. In addition, they reported improved relations with family and peers. The causal pathway of mentoring's effects on school performance appears to have been through improved relations with parents (Rhodes, Grossman, & Resch, 2000).

In summary, intentional efforts to change contexts to improve developmental success among young people largely have been shown to be effective. A cluster of intervention components including strengthened adult-youth relationships, social norms around desired behavior, development of social competencies, and provision of youth opportunities appears especially critical.

Hypothesis Two

The youth action hypothesis is the second hypothesis. The three components that comprise it are: (1) Youth action impacts contexts and the person. When youth take action to improve the contexts in which they live, the impact is enhanced because such action (properly guided and including reflection) is developmentally enhancing and, when successful, makes the target context(s) more beneficial to the actors and to other youth; (2) The impact is cumulative because youth who take action are more likely than those who do not to take action in the future, which again enhances their personal development and the contexts they have changed; their example also encourages other youth to take action; and (3) Processes for strengthening youth impact on context and self—youth participation and leadership—can be designed and implemented.

Systems and ecological models of development hold that individuals are both the products and producers of

their environments, and that it is the *relation* between the individual and environment that influences development (Bronfenbrenner & Morris, 1998; Hamilton et al., 2004; Lerner, 2002; Zeldin, 2004). As Hamilton et al. (2004, p. 15) note: "Human beings develop through active engagement with their environment; by making choices and shaping that environment, they also direct their own development." Two related processes may be at work. Young people's engagement may in fact alter how other people relate to them, and young people taking action to improve their contexts may subjectively appraise those contexts more favorably.

Youth engagement extends beyond merely providing opportunities for youth, but is rather a part of an intricate dialectic that itself characterizes positive outcomes, or thriving (Lerner, Dowling, & Anderson, 2003). Lerner hypothesizes that when this bidirectional process occurs under conditions of "building a civil society"—that is, when the ideals of equity, democracy, social justice, and personal freedoms are supported—and when youth see themselves as part of an activity or issue that is larger than themselves, this in turn impels both healthy individual development as well as salutary effects for the community (Lerner, Dowling, et al., 2003; see also Nakamura, 2001; Pancer, Rose-Krasnor, & Loiselle, 2002).

'Youth engagement' is a multidimensional term, and loosely refers to activities and constructs such as positive citizenship, volunteering, prosocial acts in the community, involvement, participation, community service, and youth voice (O'Donoghue, Kirshner, & McLaughlin, 2002; Zaff & Michelsen, 2002). Central to all of these terms is meaningful participation in an activity that links the individual, through action and commitment, to the broader context (Nakamura, 2001; Pancer et al., 2002). It is this last component—where the individual "transcends self-interest" (Lerner, Dowling, et al., 2003; p. 176)—that separates youth engagement from other extracurricular activities in which the youth may partake.

The interplay of person and context means not only that change in context changes the person, but that young people's actions inevitably alter the developmental contexts they experience, with related consequences, positively or negatively, for their developmental well-being (and as well, the positive development of their *community*—see below). For example, exploring the theoretical importance of "engagement" in living, Hunter and Csikszentmihalyi (2003) studied a diverse national sample of 6th, 8th, 10th, and 12th graders. They compared adolescents who were "chronically interested" as they went about their lives, versus adolescents who reported being habitually bored. The interested, engaged adolescents had significantly higher global self-esteem, internal locus of control, and optimism about their future, and significantly less pessimism than the bored adolescents.

Hunter and Csikszentmihalyi (2003) reasoned that, over time, engaged adolescents will develop more internal resources of confidence and enthusiasm—more "psychological capital"—than their disengaged peers, because they view themselves as more effective agents in constructing the flow of their lives. Moreover, their openness and interested connection to their experiences may both partly arise from their social capital in the form of adults' enhancing and guiding their interests, and also help create further social capital, as their very interested nature attracts others to them. Ryff and Singer (1998) also ascribe high importance to the effect that individuals' perceptions of events or circumstances have on psychological coping and how "physiological cascades unfold" (p. 13) based on perceptions.

These theoretical descriptions of social and psychological capital, and the processes that link them, are quite analogous to Benson et al.'s (1998) formulation of "external" and "internal" developmental assets being key "building blocks of success." Similar too is Lerner, Wertlieb, and Jacobs (2003) elaboration of the reciprocal individual-context relations that are the heart of developmental systems theory.

Dworkin, Larsen, and Hansen (2003) also provide a theoretical explanation of how youth participation in one kind of developmental context—extracurricular or community-based activities—might positively influence development through young people's actions. They postulated that such activities facilitate six different developmental processes: Identity exploration; the development of initiative ("the capacity to direct attention and effort over time toward a challenging goal," p. 18) and goal-directed behavior; growth in emotional competencies; formation of new and varied peer network connections; development of social skills; and the acquisition of social capital through developing relationships with nonfamily adults. Dworkin et al. concluded that a common thread connecting these processes is that the young people participating in youth programs were developing a sense of agency and seeing themselves as producers of their own development. This empirical conclusion provides support for

one of the basic tenets of both ecological and especially developmental systems theory, that children and youth help to construct their contexts and do not simply "interact" with them (Lerner, 2002).

Masten et al. (1999) used multiple methods to follow a group of 200 urban 8- to 12-year-olds for 10 years, investigating pathways to resilience. Individuals were resilient if they were adequately competent in academic achievement, conduct, and peer relations even when experiencing high adversity. They experienced positive adaptational systems much like those of low adversity and competent peers, namely, adequate IQ, high parenting quality, high self-worth, and a cheerful, energetic outlook. Consistent with positive youth development Hypothesis 2, competence in childhood longitudinally predicted positive changes in parenting quality during adolescence, and parenting quality in childhood longitudinally contributed to positive changes in peer social competence during adolescence. Children's own behaviors changed the kind of family context they experienced, as reflected in parenting, and through that path altered another developmental context, that of later peer relations.

When youth provide community service, they participate in an activity that explicitly is intended to alter both person and context. For example, Metz, McLellan, and Youniss (2003) studied 367 mostly European American, middle-class, public high school students in Boston, examining how different kinds of community service facilitated civic development (e.g., concern with poverty, intention to vote, demonstrating for a cause, future volunteering) over the course of a school year. Both social cause service (remedying a social problem) and standard service (from coaching to raking leaves) were associated with greater future intentions to serve than was not participating in service. However, social cause service during the school year was associated with greater concern for social issues and unconventional civic involvement than was standard service or no service.

Eccles and Barber (1999) examined the effects of 10th-grade prosocial activity involvement (church involvement and/or participating in volunteer and community service) on concurrent and future (2 years later) risk behaviors and academic outcomes. Students engaged in prosocial activities drank alcohol and used marijuana less at both time points than did students not engaged in these activities. In addition, involved students also had higher concurrent and future grade point averages than did their noninvolved peers, even after controlling for initial levels of outcome.

Scales, Blyth, Berkas, and Kielsmeier (2000) compared, over the course of a school year, social responsibility and academic success among middle-school students engaged in service-learning projects and a control group of students. Youth action had significant effects on young people's social contexts: Youth in service-learning projects were more likely to maintain concern for others' welfare than were control students. Moreover, service-learning students, especially girls, also declined significantly less then did control students in their frequency of talking with parents about school, a contextual effect (parent involvement) related to positive academic achievement.

In a study by Allen, Philliber, Herrling, and Kuperminc (1997), almost 700 high school students were randomly assigned to a treatment group, which consisted of structured volunteer community service time as well as a related classroom-based curriculum, or to a control group. Students involved in volunteer activities had significantly lower rates of course failure, school suspensions, and rates of pregnancy (ever been for females, responsible for pregnancy for males) than did the control group.

In a study of 972 urban, predominantly non-European American seventh and eightg graders, O'Donnell and colleagues (1999) found that students who participated in community service reported significantly less violence than did control students, after controlling for initial levels of violence, gender, ethnicity, and socially desirable responses. Students who had only a violence-prevention curriculum did not differ from controls at the 6-month follow-up, suggesting that participation in community service was critical to the changes in behavior.

These studies illustrate the significance of different kinds of youth engagement on *changes* in developmental outcomes over time. In particular, given that in many cases these effects held after controlling for potential selection-effect confounds (Atkins & Hart, 2003), these results suggest that all youth, regardless of background, can benefit from these kinds of experiences.

Youniss and colleagues (Yates & Youniss, 1996; Youniss, McLellan, & Yates, 1997) offer a more specific model for how youth participation actively facilitates not only a sense of identity, but specifically, civic identity. They argue that "participatory action" during adolescent identity formation infuses one's sense of self with a civic component; this civic component then

becomes an inextricable part of how an adolescent sees himself or herself (Youniss et al., 1997).

Youniss proposes three related consequences of youth engagement that work to influence identity formation. First, participating in community activities "allows youth to see society as a construction of human actors with political and moral goals rather than as a distant, preformed object" (Youniss et al., 1997). Second, by virtue of engaging in these kinds of activities, youth build a sense of agency regarding their own abilities to influence their surrounding contexts. Third, community involvement instills in youth a sense of responsibility for welfare of the community and its members (see also Lerner, Dowling, et al., 2003). These processes have lifelong effects on the attitudes individuals hold and the actions they take. Support for this hypothesis is provided in Youniss et al. (1997). Retrospective accounts indicated that participation in youth organizations during adolescence increased the likelihood of civic behaviors (e.g., membership in local civic, church, service, and professional groups) 15 years later in adulthood. This is interpreted as indicating that youth engagement acts as a gateway to future civic involvement (Tolman & Pittman, 2001).

The research thus shows the positive impact that youth action has on both person—young people themselves—and social context. However, most of this research concerns community service or service-learning programs, which represent only one kind of "youth action" or leadership. One review of more than 800 studies concluded that youth "empowerment," broadly construed, is a relatively less represented area of research in positive youth development (Scales & Leffert, 2004).

Hypothesis Three

The covariation hypothesis states that the Person factors (e.g., achievement motivation) and context factors (e.g., caring school climate or school boundaries) covary and are mutually reinforcing. That is, ecological factors and individual attributes tend to be directly related. Increasing assets of one kind tends to increase the other.

Developmental theory posits that person and context truly are mutually interactive. Thus, developmental assets "in" the person, such as social competencies or positive identity, should be found operating together with developmental assets "outside" the person in their various contexts (e.g., family, schools, peers, community) to promote developmental well-being and thriving. In support of this hypothesis, studies consistently find constellations of developmental nutrients, including both internal and external factors, to be associated with various outcomes. For example, Dukes and Stein (2001) measured several protective factors, including: self-esteem, positive school attitudes, prosocial activities (homework, clubs, service), purpose in life, and prosocial bonds (attitudes toward police officers). Outcomes included drug use, delinquency, and weapons possession. A second-order factor comprising the assets predicted significantly fewer of those problem behaviors among a sample of 13,000 6th to 12th grade students in Colorado. Similarly, in the Add Health study, lower levels of violence were significantly predicted by parent-family connectedness, parental expectations for education (weakly), and school connectedness. However, parent-adolescent activities or self-esteem did not predict lower levels of violence (Resnick et al., 1997).

Leffert et al. (1998) studied a sample of nearly 100,000 youth from more than 200 U.S. communities. They reported that a cluster of four assets—positive peer influence, peaceful conflict resolution, school engagement, and safety—added 30% to the explained variance of engagement in violence, compared to the 8% explained by demographics.

Crosnoe, Erickson, and Dornbusch (2002) studied a diverse sample of adolescents from nine California and Wisconsin high schools. They reported that "protection" against delinquency and substance use existed among adolescents who experienced warm relations with parents, came from relatively well-organized households, valued academic achievement, were engaged at school, felt close to teachers, and performed well in school.

Catterall (1998) analyzed subsamples from the National Educational Longitudinal Study of 1988 to explore the concepts of commitment resilience and academic resilience among 8th graders followed through 10th grade. Commitment resilience was the recovery by 10th grade of confidence in graduating among those who in 8th grade had "any degree of doubt" about graduating. Academic resilience was the significantly better performance in English of 10th-grade students who in 8th grade had C or lower grades in that subject. Both kinds of resilience were fostered by a similar constellation of positive assets. These assets included family involvement in and supports for schooling (e.g., books in the home, a place for studying, rules about TV watching [for academic resilience only]), teacher responsiveness (listening and being interested in students), fairness of

school discipline policies, and student involvement in school and extracurricular activities.

These studies illustrate the commonly observed linkage of both person and context factors in positive youth development. Some assets, such as school bonding, also well exemplify the often tenuous distinction between "internal" and "external" resources. School bonding is a particularly important developmental asset, having been linked to positive outcomes such as reduced substance use, antisocial behavior, risky behaviors such as early sexual initiation, delinquency and, most substantially, academic performance. Four dimensions of school bonding have been identified: Attachment to school (youth care about their school), attachment to personnel (connection to school adults), school commitment (the priority of school for youth), and school involvement (participation in school activities). In the social development model, involvement is seen more as a contributor to school bonding than a result of it (Maddox & Prinz, 2003), but that the construct comprises *both* internal and external dimensions underscores the covariation of person and context influences on development.

Hypothesis Four

The fourth hypothesis, termed the "pile-up" hypothesis, states that the total number of positive experiences (i.e., a pile-up of assets) is concurrently related to both positive and negative outcomes. Moreover, assets are functionally equivalent; it is the number of assets that matters, not specific assets or combinations of assets, because context-person fusion creates an infinite diversity of combinations of assets that "matter most." Research provides considerable support for the first part of this hypothesis, the "pile-up" effect associated with greater numbers of assets. But there is also considerable evidence that specific assets or clusters of assets matter more or less for specific youth (see also below under the universality/diversity hypothesis), and depending on the developmental outcome the assets are hypothesized to predict.

The accumulation of developmental strengths repeatedly has been shown to add value over the positive effects of a lesser number of strengths. As discussed in Benson et al. (2003) there are two manifestations of this pile-up, horizontal and vertical. Horizontal pile-up is reflected in cross-sectional studies that document an increased association of assets and outcomes at a single point in time when the young person experiences greater numbers of those assets. Horizontal pile-up also implies contextual breadth, if not synergy, in the experience of assets, as when the accumulation of assets experienced in multiple ecological contexts (e.g., family, school, community, peer) is more strongly associated with positive outcomes than are assets experienced in only one context.

Jessor, Van Den Bos, Vanderryn, Costa, and Turbin's (1995) longitudinal study of seventh to ninth graders was one of the first to demonstrate, not only that an accumulation of risk factors was associated with greater problem behavior, but that a greater accumulation of protective factors was associated with fewer problem behavior. Implicit in their Protective Factor Index was the representation of multiple contexts, including school, friends, family, and community elements. Gutman and Midgely (2000) documented the multiplicative effects of developmental assets on the academic achievement of African American students living in poverty and making the transition to middle school. Students with either family (high parental involvement) or school protective factors (perceived teacher support, or feelings of school belonging) had higher GPAs in sixth grade than classmates who did not experience those nutrients. But students who had both family and school assets had higher GPAs than students who had only family or school assets but not both.

In a sample of more than 100,000 youth, Benson, Scales, Leffert, and Roehlkepartain (1999) found that each successive increase in a young person's quartile asset level, from asset-depleted (0 to 10 assets) to asset-rich (31 to 40 assets) was associated with significantly more adolescent thriving (e.g., school success, overcoming adversity) and significantly less risk behavior (e.g., problem alcohol use, early sexual intercourse).

A subsequent analysis of a more diverse sample of 217,000 middle and high school students from more than 300 U.S. communities revealed the same evidence of horizontal pile-up (*Developmental assets,* 2001). Young people with 0 to 10 assets report an average of 4.1 high-risk behavior patterns; those with 11 to 20 assets report 2.3 risk patterns; those with 21 to 30 assets report an asset of just 1 high-risk behavior pattern; and asset-rich youth, and with 31 to 40 assets, report an average of just .3 high-risk patterns.

Hollister-Wagner, Foshee, and Jackson (2001) studied how developmental assets (protective factors in their terminology) might promote resilience to aggression among adolescents. In their study of rural eighth and

ninth graders, the protective factors investigated were importance of religion, self-esteem, closeness to one adult, relationship competence, constructive communication skills, and constructive anger response. For females, but not for males, the researchers found that with each increase in the simple number of protective factors, the relationship between risk factors (e.g., having been hit, witnessing parental violence) and reports of beating up one's peers weakened. Eighth and ninth-grade girls who had all six protective factors were about three times less likely as girls with only two, and four times less likely as girls with no protective factors, to report beating up someone.

Relationships with adults in school and community settings also provide valuable sources of protection from risk. For example, in the National Longitudinal Study on Adolescent Health, Resnick et al. (1997) reported that young people who experienced closer connections to their families and schools were significantly less likely than other adolescents to engage in a variety of risk-taking behaviors. Each of the contexts (family and school) by itself explained relatively modest portions (5% to 18%) of the variance across outcomes such as emotional distress, violence, and substance use. But when the effects of the other context (family or school) and assets in still other contexts (e.g., religious involvement) were included, the contribution of these assets to outcome variance increased by more than 50%.

In another report utilizing the Add Health data (U.S. Department of Health and Human Services, 1999), the extent of several positive behaviors among 7th to 12th graders was noted, such as getting B or higher averages, involvement in extracurricular activities, and religious involvement once a month or more. The more positive behaviors in which students engaged, the fewer the number of risk behaviors in which they engaged.

Cumulative environmental risk has been shown to be predictive of internalizing and externalizing problems, not only as the absolute number of risks increases, but as the number of social domains (e.g., family, peer, school, neighborhood) being high-risk increases (Gerard & Buehler, 2004). Sanders's (1998) study of more than 800 urban African American students in the eighth grade lends further support to the hypothesis that, analogous to the findings for risk, *strengths* piling up *across* ecological domains magnify the protective and thriving effects of positive experiences in single contexts.

He reported that when all three support contexts—family, school, and church—were combined, the effect on academic self-concept (which most strongly predicted actual achievement) and achievement ideology were stronger than the unique effects of any of the individual contexts (the combined effect on school conduct was comparable to the individual effect from teacher support). This finding suggested that "when students receive support from the family, church, and school simultaneously, the effects on their attitudes about self and the importance of schooling are magnified" (Sanders, 1998, p. 402).

The effects of positive experience across multiple contexts can be seen as well in Scales, Benson, et al.'s (2000) study of the relations among developmental assets and thriving indicators. For example, among European American 6th to 12th graders, achievement motivation alone explained 19% of the variance in school success (self-reported grades). But school engagement, time in youth programs, time at home, planning and decision making, parent involvement in school, and self-esteem added another 12% of variance (Scales, Benson, et al., 2000). The Search Institute findings are consistent with those reported by Eccles, Early, Frasier, Belansky, and McCarthy (1997). In their study of middle school students, the explained variance of adolescent outcomes was "substantially increased" when all the contexts studied (family, school, and peers) were added into regressions, leading the researchers to conclude that positive experiences across contexts add "linearly and independently" to contribute to positive development.

Brody, Dorsey, Forehand, and Armistead (2002) studied the contribution of supportive parenting and classroom processes to the psychological adjustment of African American elementary and middle school students living in poverty in the South. For both grade cohorts, they found that students experiencing high parenting (high monitoring and a supportive, involved mother-child relationship) or classroom quality (high levels of organization, clarity of rules, and involvement of students) had better adjustment than students experiencing low quality in both contexts. However, students experiencing high quality in *both* contexts had the best adjustment, as reflected in the highest self-regulation scores, and lowest externalization and depression scores.

Similar findings, among fifth and sixth graders, are reported by Paulson, Marchant, and Rothlisberg (1998) in a study of the effect of children having assets across contexts. Children with the highest achievement perceived a consistency and congruence of parenting and teaching styles, accompanied by high parental involvement in school and a caring school climate. The assets provided by family and school enabled those children to

enjoy more positive outcomes than children who experienced assets in only one of those contexts.

A test of the social development model (Catalano & Kosterman, 1996) found an acceptable fit to predicting drug use among 590 17- and 18-year-olds on the basis of variables measuring prosocial and antisocial influences from fifth grade through middle school. In addition to prior drug use, the model includes such protective factors as: perceived opportunities and rewards for prosocial involvement (knowing where to go to join clubs, participating in family decisions, having lots of chances for extracurricular activities), reported involvement in prosocial activities (including church attendance and membership in community groups), social competencies, attachment and bonding to prosocial others, and belief in the moral order (e.g., importance of telling the truth, whether it is okay to cheat). All the path coefficients for protective factors to drug use were significant and in the expected direction.

In a study of 12,500 9th to 12th graders from the original Add Health study pool of 7th to 12th graders, Zweig, Phillips, and Lindberg (2002) reported that students with higher levels of protective factors (e.g., decision-making skills, participation in physical activities) consistently had significantly lower levels of behaviors such as sexual activity, alcohol use, binge drinking, other drug use, fighting, and suicidal behaviors.

Similarly, Jessor et al. (1998) examined risk and protection especially among disadvantaged students, with disadvantage defined by low parental occupational status, low parental education, and single-parent family structure. The outcome variables of interest were school engagement, low problem behavior, and a composite of the two, labeled "Making It." They reported that a protective factor index contributed about as much to variance in the successful outcomes as did a risk factor index. For example, risk contributed 32% to the composite measure of Making It, compared to 26% for protection.

Benson and Roehlkepartain (2004) studied the relation of assets to substance use among a cross-sectional sample of more than 217,000 6th to 12th graders. They reported that young people with low levels of developmental assets (0 to 10 of the 40 assets) were from 2.4 to 4.4 times more likely to engage in different kinds of alcohol, tobacco, and other drug use than were students at average or higher levels of assets (21 or more assets). The effects of assets were stronger than that of SES or living in a single-parent family.

The pile-up effect is seen for other outcomes as well. For example, the overall level of evidence (Miller & Thoresen, 2003) for the theoretical connection between assets and greater school success appears to be *persuasive,* supported by scores of peer-reviewed studies. However, this conclusion pertains only when a number of assets and other factors (e.g., teachers' collective efficacy) are operating together; rarely do single assets or other factors (excepting near tautologies such as previous grades predicting future grades) account for considerable variance in school success outcomes (Wang, Hartel, & Walberg, 1990). Benson et al. (1999), for example, reported that in a sample of nearly 100,000 6th to 12th graders, each quartile increase in students' levels of 40 developmental assets (i.e., from 0 to 10, 11 to 20) was associated with a significant improvement in self-reported grades.

Similarly, Scales and Benson (2004) created a prosocial orientation measure by combining several items tapping adolescents' attitudes toward helping others, and several items asking about intentions to help those in need, working to improve their school, or tutoring or coaching younger children over the next year. They then examined the concurrent relation to prosocial orientation and the number of developmental assets adolescents reported. In a racially/ethnically diverse sample of more than 5,000 6th to 12th graders, they found that each increase in the quartile level of the asset domains studied (0 to 2, 3 to 5, 6 to 8, or 9 to 12 assets) was associated with a significant increase in the mean score on prosocial orientation. They also found that, controlling for grade in school, race/ethnicity, and parental education, both boys and girls with above average levels of prosocial orientation were nearly four times more likely to report actual volunteer service of at least 1 hour per week in the past year.

Overall, the empirical evidence is consistent and strong for the theoretical relation between the number of assets that adolescents experience and the positive developmental outcomes of both greater thriving and lessened risk behaviors.

Hypothesis Five

The longitudinal hypothesis is defined as the fusion of context/person dynamics in the presence of high levels of developmental assets results *over time* in (a) lessened risk behaviors; (b) increased academic achievement; (c) increased contribution; and (d) higher levels of other thriving indicators.

Numerous studies have demonstrated the contribution that developmental assets make to positive youth

outcomes not only concurrently but also over time. For example, more than 30 longitudinal studies showing these relations are cited in comprehensive reviews of research on developmental assets in adolescence (Scales & Leffert, 2004) and middle childhood (Scales et al., 2004). Although in all cases, the studies focus on only one or a small number of assets, not the entire range of 40 assets identified by Search Institute, the results are nevertheless consistent: The experience of developmental assets contributes significantly to the likelihood of subsequent protection from high-risk behaviors and promotion of thriving.

For example, Moore and Glei (1995) found that young people who as children and adolescents participated significantly more than their peers in school clubs were especially likely to report positive outcomes *in young adulthood* (ages 18 to 22). Outcomes included closer relationships with their parents, and greater involvement in community affairs or volunteer work.

In a small ($N = 100$) sample of racially/ethnically diverse adolescents from low-income families, Way and Robinson (2003) found, as predicted, that the asset of positive school climate contributed to higher levels of self esteem at 2 years later, over and above the positive effects of family and friend support. Masten et al. (1999) followed a sample of urban 8- to 12-year-olds for 10 years. They showed that even after controlling for IQ and socioeconomic status (SES), the quality of parenting in mid-adolescence predicted academic, conduct, and social competence in late adolescence. Perhaps more striking, the quality of parenting in childhood predicted social competence 10 years later in late adolescence.

Pettit, Bates, and Dodge (1997) reported similar longitudinal results in their 7-year study of more than 500 Tennessee and Indiana families with kindergartners. The quality of supportive parenting children received as kindergartners (e.g., parental warmth and involvement, proactive teaching, calm discussion) contributed a small (1% to 3%) but unique amount of variance to the prediction of their functioning in both kindergarten and grade six, including whether they exhibited problem behaviors, were socially skillful, and performed well in school. This study was notable for showing that the presence of positive parenting, not merely the absence of harsh parenting, plays an important role in contributing to child well-being in both the short- and longer-term.

Moreover, as for studies reflecting horizontal pile-up, experiencing assets in multiple contexts also is developmentally advantageous over time. Cook, Herman, Phillips, and Settersten (2002) reported in their study of changes in early adolescent development that the effects of *individual* contexts on development were generally quite modest. However, the *additive* effects of adolescents' multiple positive contexts were considerable, a result in alignment with other research showing the value of young people experiencing "redundancy" of developmental assets across their ecologies (Benson et al., 2003).

Ultimately, the most important "outcome" of positive development is more postive development. The findings of the Iowa Youth and Families Project are illustrative. The researchers (Conger & Conger, 2002) reported that the assets of nurturant and involved parenting experienced in seventh grade helped young people have fewer emotional and behavioral problems and function more competently during adolescence, even when dealing with family economic adversity. But young people who experienced those family assets during adolescence also were themselves more competent parents and more successful in their romantic relationships years later in *early adulthood* (5 years posthigh school).

Gambone et al. (2002) created indices to measure several optimal adolescent developmental outcomes (young people are productive, connected, and can navigate through their worlds effectively), and several optimal young adult outcomes (individuals are on a path to economic self-sufficiency, have healthy family and social relationships, and are involved in the community). About half of youth were doing well overall in young adulthood, but 69% of those with optimal developmental milestones in high school subsequently did very well, with a 41% greater chance of experiencing such optimal young adult outcomes. Moreover, young people who had optimal levels of the developmental nutrients *early* in high school were much more likely to have the positive developmental milestones later in high school. For example, youth who had supportive relationships with parents, teachers, and friends early in high school were 100% more likely to have optimal developmental outcomes later in high school.

Analysis by Search Institute (2004) of a longitudinal sample of 370 students in St. Louis Park, Minnesota, from when they were in 7th to 9th grades to when they were in 10th to 12th grades, showed that, in general, the more assets students reported in 1998, the less they reported risk-taking behavior patterns (e.g., driving and alcohol problems, school problems) and the more they reported indicators of thriving (e.g., delayed gratifica-

tion, physical health) in 2001 (unpublished analyses for this chapter; for study details see Scales, Benson, Roehlkepartain, Sesma, & van Dulmen, in press; Scales & Roehlkepartain, 2003). These results were largely maintained even when controlling for earlier levels of the outcome variables. Additional perspective came from using a more person-centered analysis. Students who stayed stable or went up .5 SD in their assets over those 3 years had significantly fewer problem alcohol use or school problems, and more informal helping, leadership, overcoming adversity, and school success than students who declined .5 SD in their assets.

Moreover, both concurrently and longitudinally, each quartile increase in assets was associated with significantly higher GPA, and the longitudinal relations held even when controlling for the effects of earlier GPA (Scales & Roehlkepartain, 2003). The difference in mean GPA between asset-rich students (31 to 40 assets) and asset-depleted students (0 to 10 assets) was equivalent to the difference between a B+ and a C average. In addition, growth curve analysis showed a small but significant relationship between increase in assets and increase in GPA, such that mean GPA increased about ⅕th of a grade point over time for each increase of one asset.

In a small study of 95 inner-city sixth to eighth graders (about 60% non-European American), Dubow, Arnett, Smith, and Ippolito (2001) reported that the asset of positive expectations for the future, as assessed in September, significantly predicted lower levels of a problem behavior index in June, including using alcohol. In addition, higher initial levels of perceived problem-solving efficacy and family support predicted increases over the school year in positive expectations for the future. In another example, the social development model was applied to promote children's bonding to school in Seattle. Children who received a program in Grade 5 emphasizing the development of social competencies and bonding to school experienced, by age 21, significantly more responsible sexual behavior, including fewer partners and less sexually transmitted diseases, than peers not exposed to the program (Lonczak, Abbott, Hawkins, Kosterman, & Catalano, 2002).

Benson and Roehlkepartain (2004) also conducted longitudinal analyses on a sample of middle school students who reported abstaining from alcohol, tobacco, or drug (ATOD) use in 1997. Those who continued to abstain in high school 4 years later, compared to those who began ATOD use, had significantly higher levels of assets in both 1997 and 2001, especially in the categories of support, and boundaries and expectations. These results offer an additional provocative suggestion of the role of developmental assets in protecting young people from ATOD risks.

Participation in youth programs was found in both the Scales, Benson, et al. (2000) and Scales and Roehlkepartain (2003) Search Institute studies to be linked to school success. In a study focusing on the role of such extracurricular programs on posthigh school educational achievement, Mahoney, Cairns, and Farmer (2003) utilized the Carolina Longitudinal Study to follow nearly 700 students annually from 4th grade through 12th grade, interviewing them again when the young people were 20. They found that consistency of extracurricular participation was significantly associated with both interpersonal competence over time, as well as with educational aspirations in late adolescence, and both of those factors were linked to educational status (whether in postsecondary education or not) at age 20. The researchers explained the theoretical basis for such results by noting that the peer and adult relationships and skills associated with sustained extracurricular activity participation promote social acceptance, positive social identity development, less depressed mood and anti-social behavior, school engagement, and higher educational expectations.

In an analysis of several waves of data from the National Education Longitudinal Study of 1988, Zaff, Moore, Papillo, and Williams (2003) reported that volunteering 2 years after high school was significantly more likely among students who enjoyed key developmental assets from grades 8 to 12, such as having high levels of parental support and monitoring, positive peer influences, and attendance at religious services. Moreover, if students consistently participated in extracurricular activities during grades 8 to 12—regardless of whether those activities were sports, schools clubs, or community clubs—they were twice as likely to volunteer and to have voted in local or national elections 2 years after high school as students with only occasional extracurricular participation.

The overall pattern of these results suggests that developmental strengths provide some unique proportion of influence over time in addition to their much more substantial impact on concurrent developmental outcomes. In both their strong concurrent relations and small to moderate longitudinal relations, they provide support for the theoretical proposition that developmental assets positively affect developmental trajectories.

Hypothesis Six

The Community Hypothesis is based on the notion that community is a viable focus for understanding and promoting dynamics crucial for maximizing context/person relationships. By analogy to public health, the largest improvements in positive youth development will occur in response to interventions/initiatives that are aimed at changing communities more so than those aimed at individuals. How the community is defined depends on the target(s) of the intervention/initiative.

The inadequacy of individual treatment is related to the principles of public health and prevention. Despite dramatic improvements in medical treatment, Kreipe, Ryan, and Seibold-Simpson (2004, p. 104) point out that "Improved sanitation, work environments, and immunization programs as well as safety measures . . . have done more to improve health than one-to-one medical treatment."

Similarly, community mobilization to promote positive youth development must address not only formal organizations and programs but also informal norms and relationships. Studies show that youth do better in communities where adults share some basic values, norms, and expectations, including understandings about what kind of behavior is acceptable and what to do when someone crosses the line (Damon, 1997; Sampson et al., 1997).

In this section, we refer to community as the interlocking systems of contexts, ecologies, and settings that moderate developmental growth. Accordingly, there are within this broad conception a wide range of influences on development, including family, neighborhood, school, playground, and congregation, the relationships inside and beyond these settings, and the policy, business and economic infrastructure of a community.

Tolan, Gorman-Smith, and Henry (2003) conducted a 6-year longitudinal study of several hundred African American and Latino adolescent males and their primary caretakers. As predicted by bioecological theory (Bronfenbrenner & Morris, 1998), they reported a complex relationship among community structural characteristics, neighborhood processes, parenting practices, and youths' violent behavior. Neighborhood concentrated poverty and high crime levels were found to predict the extent of perceived neighborhood problems and neighborliness, as well as directly to predict parenting practices, such that high poverty and crime were related to more restrictive parenting, which reduced violence by limiting youths' gang involvement.

Scales and Roehlkepartain (2003) found that for every point higher students scored in 1998 on a developmental assets factor reflecting connection to community, they were three times more likely than other students to be in the high GPA group (B+ or higher) in 2001. Assets in that factor included youth programs, religious community, service to others, creative activities, reading for pleasure, other adult relationships, and adult role models. The results of this study are provocative in suggesting how a multiplicity of assets reflecting the developmental attentiveness of "community" may favorably affect young people's school success.

Similarly, Greenberg et al. (2003) reviewed a wide range of evidence that suggests the most effective school-based prevention and youth development data are those that "enhance students' personal and social assets" and improve the school-community environment (p. 467). The focus of effective approaches is not on narrow programs addressing a single issue—programs that often may be disruptive more than beneficial—but comprehensive efforts that try simultaneously to build students' health, character, citizenship and community connection, school orientation, and academic performance. The American Psychological Association's Task Force on Prevention, Promoting Strength Resilience, and Health in Young People, also endorses a broad approach that coordinates problem-prevention with efforts to build young people's competence, relationships with others, and contributions to the community (Weissberg et al., 2003).

Echoing the research presented earlier as relevant to the first positive youth development hypothesis (i.e., that contexts are modifiable, and that these changes in contexts have consequences for youths' developmental outcomes), a core of strategies repeatedly appears in reports of successful efforts. These include: building students' social-emotional learning repertoire, providing frequent opportunities for student participation, such as through community service, fostering caring, supportive relationships among students, teachers, and parents, and consistently rewarding positive social, health, and academic behaviors through school-parent-community collaborations.

Much of the source for the impact of community comes from adults outside young people's own families. Recent research has documented clearly the value of formal mentoring relationships for young people (DuBois, Holloway, Valentine, & Cooper, 2002; Rhodes et al., 2000). The more global influence of "other adult assets" that occur quite naturally in young people's

lives, such as with neighbors, is potentially more far-reaching but has been less well studied. The limited evidence suggests that only 15% of young people report experiencing a "rich" level of relationships with adults other than parents (Scales, 2003; Scales et al., 2002).

But the climate of social expectations is crucial. Sixty-two percent of U.S. adults with *strong* social expectations for involvement are highly engaged with other people's children, versus 41% for those who feel only moderate expectations, 22% for those with mild expectations, and just 9% for those with weak social expectations for involvement (Scales, 2003). Consequently, although studies regularly demonstrate the effect of "community" as a source of developmental assets, potentiation of the full range of possible positive community impact on youth development requires attention to changing existing social norms about adult-youth engagement.

Some of the more ambitious efforts to intervene at the level of community have been initiated by national foundations. The Kellogg Youth Initiative Partnerships (KYIP) were launched in 1987 to assist three Michigan communities in expanding beyond investment in "fixing young people's problems" to community collaborations engaged in promoting youth potential. Combining service integration with youth development principles and a focus on school reform, the Annie E. Casey Foundation in 1987 launched New Futures, a 5-year demonstration project in five cities with high percentages of high-risk youth. In 1995, with funding from a consortium of foundations, Public/Private Ventures (P/PV) launched its Community Change for Youth Development Initiative (CCYD). The CCYD provided communities with a set of research-based core principles and with strategies for implementing them. Among the principles were adult support and guidance and structured activities during nonschool hours.

None of these initiatives reported large and consistent effects in terms of outcomes for youth. However, new programs, organizations, and leaders demonstrated enduring impact. For example, 5 years after New Futures funding was ended, investigators (Hahn & Lanspery, 2001) attributed "change that abides" to the "ripeness" of the communities for change, including leadership, a widespread recognition of problems, and utilization of other resources and initiatives with compatible goals.

In a similar vein, a report from the Kellogg Foundation (n.d.) after the 1st decade of KYIP stressed the critical importance of engaging the community. Such engagement critically includes youth themselves. And from the lessons of CCYD, Gambone et al. (2002) have articulated and demonstrated a convincing rationale for evaluating the *opportunities* such an initiative creates for youth rather than focusing solely on impact or outcomes for individual youth. The "community action framework for youth development" (Connell et al., 2001) embeds such opportunities in a theory of change that can be theoretically and empirically linked to desired outcomes, some intermediate-term and some long-term.

In a particularly useful analysis of community initiatives, Dorgan and Ferguson (2004) examined factors critical to the success (or lack of it) in the New Futures initiative and the New York City Beacons project (community centers operating in public school buildings). Though the two initiatives had similar aspirations, they were directed by quite different theories of change and implementation strategies. The authors credit the particular success of the Beacons project to a clear, understandable, and politically compelling emphasis on co-locating services, supports and opportunities in neighborhood schools to create "safe havens" for youth. In addition, the Beacons' focus on professionals working directly with youth and on the grassroots support of volunteers, parents, and neighborhood residents led to faster achievement of goals than the New Futures approach of creating collaboratives to plan and coordinate youth services and programs city-wide.

A somewhat different theory of change undergirds Search Institute's national Healthy Community • Healthy Youth movement. With 600 communities currently engaged (Benson, 2003a), this change strategy invites communities to create multiple innovative "experiments" to transform contexts and ecologies with a particular eye to mobilizing asset-building adult and peer relationships. A number of studies are completed or ongoing in capturing both how transformative change is made and the connection of these changes to adolescent health and well-being (Mannes, Lewis, Hintz, Foster, & Nakkula, 2002; Whitlock & Hamiltion, 2003). A longitudinal study in St. Louis Park, Minnesota provides suggestive evidence that sustained community-wide engagement with asset-building has population-level effects on several measures of well-being (Roehlkepartain, Benson, & Sesma, 2003).

These studies generally support the broad hypothesis that describes "community" as an important focus of positive youth development efforts. However, much research is needed to better understand how specific conceptualizations of "community" operate to positively influence

young people, and how those effects may vary as a function of varying realities of person-context fusion.

Hypothesis Seven

The Universality/Diversity Hypothesis proposed that there are developmental supports and opportunities that enhance developmental success for all youth; strategies and tactics for promoting them vary. Moreover, because all youth need developmental assets, many community-level interventions will benefit all or almost all youth. However, youth with few or no assets may require interventions targeted to them and their specific needs. One of the functions of those extraordinary interventions is to enable those youth to benefit from more universal interventions.

There are likely variations in the degree to which developmental assets can explain developmental outcomes, and in which assets may be most critical in promoting specific outcomes, depending on differences among young people's contexts and developmental histories. But studies (e.g., reviews in Montemayor, Adams, & Gullotta, 2000; Scales et al., 2004; Scales & Leffert, 2004) suggest significant theoretical and practical insights relevant for most if not all groups of young people in looking at their development through a strength-based lens.

However, compared to the literature on developmental strengths and young people of differing gender, age, racial/ethnic groups, and socioeconomic status, there is a dearth of empirical work on relating developmental strengths to other dimensions of diversity, such as sexual orientation, family background, or differing exposure to violence. Goldfried and Bell (2003), for example, describe literature on sexual minorities as essentially "ignored" in mainstream psychology and adolescent development. The available evidence suggests that at least some developmental strengths, such as self-esteem and, particularly, family support, seem to diminish or eliminate differences in mental or behavioral health problems among both sexual majority and minority youth (Blum, Beuhring, & Rinehart, 2000).

YOUTH DEVELOPMENT RESEARCH

We next briefly describe illustrative research pertaining to positive youth development as reflected across gender, age, SES, and race/ethnicity.

Gender

Studies consistently find that females report higher levels of most developmental assets than do males, with the exception of self-esteem (see reviews by Scales & Leffert, 2004; Scales et al., 2004). The consistency of such findings across studies and measures provides evidence for the validity of this basic conclusion. However, these systematic differences may be produced by a lack of measures tapping potential assets that may be more common among young men (e.g., assertiveness, competitiveness). Reported gender differences in some assets also may be a result of systematic response biases from young people responding in gender-typed ways (e.g., girls' greater reporting of prosocial attitudes and behaviors—Eisenberg & Fabes, 1998). Apart from frequency differences, however, numerous studies suggest that assets may operate somewhat differently for males and females.

Huebner and Betts (2002) used social control theory to frame a study of 911 7th to 12th graders from a mining community in the southwest. They found that both attachment bonds (connections to parents, unrelated adults, and peers) and involvement bonds (time in school and nonschool activities, including time in religious activities, volunteering, and clubs or organizations) predicted less delinquency and greater academic achievement (self-reported grades). Involvement bonds predicted delinquency more for males than females, and attachment bonds predicted grades more for females than for males.

Hollister-Wagner et al. (2001) studied resiliency with regard to aggression (beating up a peer). In a large sample of rural eighth and ninth graders, they found support for the role of protective factors in reducing violence for females, but not males. The researchers reasoned that exposure to aggressive models, and social reinforcement for aggression, is sufficiently stronger for males that protective factors, although still positive, have a weaker influence on them.

Age

High school students consistently are found to report fewer developmental assets than do middle school students. For example, in a cross-sectional sample of more than 217,000 6th to 12th graders, whose average number of 40 assets was 19.3, 6th graders reported 23.1 assets, 8th graders reported 19.6, and 10th graders reported

17.8 (Benson, 2001). Asset levels were somewhat higher among 11th and 12th graders (to 18.1 and 18.3 assets, respectively), but still remained lower than asset levels among the younger students. Similarly, in a study of more than 5,000 6th to 12th graders in a mid-sized Western city, Scales, Leffert, et al. (2003) reported that 6th to 8th graders reported significantly more exposure than 9th to 12th grade students to most assets, including positive relationships with unrelated adults and consistency of expectations for behavior. In a longitudinal study of 370 students, Roehlkepartain et al. (2003) reported that asset levels declined sharply across 6th to 8th grade, bottomed out between 9th to 11th grades, and evidenced a slight rebound in the 12th grade. In another analysis of the same longitudinal sample, Scales and Roehlkepartain (2003) reported that 41% of these students decreased at least .5 standard deviations in their assets from middle school through high school. Another 34% stayed relatively stable, and only 24% increased at least .5 standard deviations in asset levels over the middle school to high school period.

Similarly, Scales et al. (2004) found that fourth and fifth graders reported more assets than did sixth graders (26.6. and 26, respectively, versus 24.7 for sixth graders). Only for safety did sixth graders report higher levels than fourth to fifth graders. Although longitudinal data are not yet available to confirm that those grade differences result from declining assets as cohorts age, the longitudinal results for older youth suggest that this interpretation is warranted.

Race/Ethnicity and SES

Drawing on seven national, state, and local studies with racially/ethnically diverse adolescent samples, Rowe, Vazsonyi, and Flannery (1994) argued that developmental processes appeared similar across racial/ethnic categories in effects on outcomes such as IQ, achievement, and social adjustment. The variables investigated included parental involvement and monitoring, self-efficacy, school self-esteem, parents' school encouragement, family communication, and attachment to teachers. The covariance matrices of the associations between these developmental influences and outcomes had significant and similar goodness-of-fit indexes across African American, Asian, Hispanic, and European American adolescents. The degree of similarity between racial/ethnic groups was no less than the degree of similarity found in comparing covariance matrices of random halves of a single racial/ethnic group, which would be expected to be highly similar.

Rowe et al. (1994) did not investigate precisely *how* assets and outcomes were related across racial/ethnic groups. Although developmental assets in general appear to have comparable positive relations with developmental outcomes for most groups of youth, how particular assets function to promote positive outcomes may well vary depending on which dimensions of diversity are examined. For example, Bean, Bush, McKenry, and Wilson (2003) studied the relation of components of authoritative parenting to academic achievement (self-reported grades) among 155 African American and European American high school students. They found that parental support, behavioral control, and psychological control had significantly different relations with grades, depending on parents' race and gender. For African American students, maternal support was significantly related to academic achievement, but the other components were not, and none of the parenting components was significant for African American fathers. But for neither European American mothers nor fathers was support a significant contributor to achievement. For European American students, fathers use of greater behavioral control, and mothers use of greater behavioral control and less psychological control, were significant predictors of academic success.

Sesma and Roehlkepartain (2003) examined developmental assets and outcomes among 217,277 6th- through 12th-grade students (including 69,731 youth of color) surveyed in 318 U.S. communities during the 1999/2000 school year. Across all racial/ethnic groups, greater numbers of developmental assets were associated with fewer risk behavior patterns and more thriving indicators. These relations held even after controlling for socioeconomic status. For example, across all racial/ethnic groups, young people who engaged in none of 10 high-risk behavior patterns averaged experiencing about 23 assets, whereas those who reported engaging in 5 or more of the 10 risk patterns said they experienced 15 or fewer of the developmental assets.

At the same time, there were racial/ethnic differences. For example, boundaries and expectations assets (e.g., family rules, neighborhood social controls, and adult role models) were important for all youth in helping them avoid anti-social behavior, but were found to have especially strong preventive associations for American Indian, Multiracial, and European American youth (Sesma & Roehlkepartain, 2003).

Scales, Benson, et al. (2000) also reported that specific clusters of assets could explain from 19% to 32% of the variance in self-reported grades, over and above demographics, among six different racial/ethnic groups of students. The assets of achievement motivation, school engagement, time in youth programs, time at home, and personal power meaningfully contributed to variance in grades for three or more of the six racial/ethnic groups.

In an interview study with 45 male African American gang members and 50 similar youth connected to community organizations, Taylor et al. (2003) found that the nongang youth reported significantly more positive developmental experiences. However, across nine categories of positive attributes that reflect developmental assets, an average of 28% of the gang members scored above the mean for the nongang youth, suggesting that a reservoir of developmental strengths may exist among even "deviant" youth assets that supports their positive growth. For example, more than one-third of the gang youth had more positive relations with family and with school or education than the nongang youth, and a fifth had more positive role models than did nongang youth. In a 1-year longitudinal analyses of this sample, Taylor et al. (2002) also reported a sizeable correlation (.67, $p \leq .01$) between change in developmental assets from Time 1 to Time 2, and changes in individual growth in positive personal and social functioning. These findings point to two tentative conclusions: (1) that the developmental assets that support positive outcomes are not entirely absent even for young people who currently are "embedded in a behavioral and social milieu marked by risks (e.g., gang violence, drugs, and poor familial support) [and] . . . ambient problems of poverty and racism" (p. 513), and (2) that enhancing developmental assets may facilitate positive trajectories for a subset of such challenged youth.

In another study of several hundred gang and nongang adolescents, Li et al. (2002) also found, as expected, that gang members on average reported fewer resilience factors in their lives. But like Taylor et al. (2003), Li et al. also reported that gang and nongang youth were not significantly different on a number of those contributors to resilience, including social problem-solving skills, self-esteem, physical activity, and academic performance. That is, both these studies suggest that individual and ecological characteristics that promote health and thriving exist among a substantial proportion of seemingly "lost" young people, representing a potentially valuable target of community actions to build better developmental paths for all young people.

There is little research on developmental assets among mixed-race or multiracial adolescents. A recent report drawing on the national Add Health dataset focused solely on risk behaviors, and concluded that mixed-race adolescents, regardless of which racial/ethnic groups were combined, tended to have higher incidences of health and behavioral risks than single race youth. Although impossible to confirm with those data, the researchers speculated that the results were consistent with a theoretical explanation pointing to mixed-race status increasing the stress those young people faced (Udry, Li, & Hendrickson-Smith, 2003).

In one study of positive development that included self-described Multiracial youth, Scales, Benson, et al. (2000) reported that clusters of developmental assets had significant explanatory power for concurrent indicators of thriving among 6,000 middle and high school youth across racial/ethnic groups (American Indian, African American, Asian, Hispanic, Multiracial, and European American). For example, aggregating the indicators into an index of thriving, clusters of the assets explained from 47% of variance among American Indian youth to 54% among Multiracial youth, over and above gender, grade, and level of maternal education. There were some differences across groups. For example, experiencing supportive relationships with adults other than parents was an important contributor to the thriving index for Multiracial, American Indian, and European American youth, but reading for pleasure was more important among African American and Hispanic youth. However, a core of assets was important across groups. Time spent in youth programs, cultural competence, self esteem, personal power (a construct akin to self-efficacy), achievement motivation, and planning and decision-making skills each meaningfully contributed to variance for at least two of seven thriving indicators across at least three out of six racial/ethnic groups.

DIRECTIONS FOR FUTURE RESEARCH

Although the past 10 years have seen a proliferation of conceptual models seeking to articulate the necessary ingredients for positive development and subsequent empirical tests of these models, on balance the state of our knowledge is disproportionately low compared with the state of our unknowns. Our knowledge-base is relatively strong in the following areas:

- Taxonomies of factors that are correlated with positive outcomes.
- Cross-sectional research results affirming associations among relationships, opportunities, social norms, and positive developmental outcomes.
- Knowledge that effective programs have the capacity to promote short-term changes in youth behaviors.

Lacunae in our knowledge base regarding developmental assets include the following:

- Theories of change that articulate *how* youths, adults, and community systems move toward greater developmental attentiveness.
- Explorations of the transactional nature of community-youth change; that is, examinations of both how community efforts (both informal and programmatic) affect youth, as well as how youth in turn affect and help shape their ecology.
- Empirical understanding of the significance of "informal, natural, and nonprogrammatic capacity of community" (Benson & Saito, 2001, p. 146).
- Understanding of the variability in the delivery of developmental assets across diverse communities and groups of people. While we can specify the necessary ingredients, we still do not well understand how those ingredients "work" in culturally diverse settings.
- Understanding of how broad, expansive models of community involvement and engagement interact with more focused programmatic approaches (i.e., does the presence of the former moderate the efficacy of the latter?).

In addition, the empirical literature offers to date only limited answers to the following more specific theoretical questions:

- How is the theory connecting assets to thriving outcomes the same as that linking assets to risk reduction outcomes, and how is it different? Relatedly, are "internal" asset categories such as positive values or positive identity more properly thought of as indicators of well-being, that is, as outcomes?
- Is the role of developmental assets global, or dependent on the outcome of interest?
- Is the effect of assets invariant across contexts, or does social domain make a difference in how assets affect outcomes? For example, do the same assets that explain delay of gratification in the school domain also explain delay of gratification in the peer domain?
- Is there such a thing as too much of particular developmental assets, such that they no longer are assets and even become deficits or risk factors (e.g., family support becoming enmeshment, or high expectations becoming a factor that lessens perceived feelings of competence)?
- Are there ceiling effects not yet revealed in the research? For example, a close relationship with at least one caring adult is clearly important, and probably having that with several adults is better, but what does a dozen such relationships add that five or six does not? Whitlock (2003) reported, for instance, that youth reporting 9 or 10 of 10 possible developmental supports did not have greater school connectedness than youth reporting 7 or 8 of those supports. But developmental supports showed a continued linear relationship with *community* connectedness, that is, a ceiling effect was not observed for community connectedness.
- If all assets are not equal in their promotive and protective valence, then what are the bases on which some assets are considered more important than others, if not for all young people, then for some youth in some situations for some outcomes?
- Do some assets function as "gateways" more than others, making it more likely that young people will experience additional assets that collectively promote positive developmental outcomes? Scales and Roehlkepartain (2004), for example, found that students who provided community service in middle school were significantly more likely to be "asset-rich" in high school than were students who did not contribute service.
- Are some assets more critical for healthy development at differing developmental points or stages? For example, are high expectations from teachers and parents more critical in middle school and early adolescence, when increases in challenges to competency beliefs are common, than in later adolescence? Similarly, does the asset of cultural competence become *more* important as children age and encounter increasingly more diverse peers and adults?
- In a related sense, do some assets have more impact during key developmental transitions than at other times? For example, are young people feeling valued and that they have useful roles more important assets during the transition from elementary to middle

school and the transition from middle school to high school than they are at other times during early and later adolescence?
- How many of developmental assets does one need, over what period of time, to contribute meaningfully toward particular desired outcomes?

In addition to these questions, there exist issues regarding the design of research within which the questions may be addressed. Approaches such as the theory of change strategy for evaluating comprehensive positive youth development initiatives have been discussed for some time (see Connell & Kubisch, 2001; Connell, Kubisch, Schorr, & Weiss, 1995). But only a limited number of examples show such technology actually being applied, and a broad consensus does not exist about what reasonable outcomes for community initiatives may be (Berkowitz, 2001; Spilka, 2004).

Moreover, although the research to date shows promising results, the existing literature focuses almost exclusively on assessing the effects of community interventions on adolescent problem behaviors such as alcohol and other drug use, adolescent pregnancy, and antisocial behavior. Few positive outcomes other than academic success tend to be measured in *community,* as contrasted with program, initiatives (Greenberg et al., 2003; Wandersman & Florin, 2003).

MacDonald and Valdivieso (2001) also observed that deficit-oriented measures prevail in national tracking systems. They described numerous possible positive constructs and measures that are being or could be applied in gathering data across four critical domains: young people themselves, parent and nonparent adults, organizations that serve young people, and community-level data on policies, resources, and services.

Weissberg et al. (2003) also note that despite an impressive literature now suggesting the effectiveness of strength-based approaches to prevention and youth development, there is a continuing need for evaluations of multiyear, comprehensive youth development initiatives that target multiple outcomes. Especially needed are investigations of the mediating and moderating influences on program or initiative effects, and how strength-based approaches work similarly or differently across diversities of geography and circumstance. Finally, they noted the need for more standardized measures of core youth development outcomes, so that results across different studies can more readily be compared.

The lack of common positive measures of development decried by Weissberg et al. (2003) is not unique to youth development. Ryff and Singer (1998) struck a similar chord in talking about research on "health" among older adults. Such research, they argued, routinely defines health by emphasizing the absence of negatives, such as being unable to dress and feed oneself, at the expense of inquiring about the positive indicators of purpose and engagement in life that actually may better predict health outcomes. To more accurately understand health, they argued, questions should be asked about what persons did today "that was meaningful or fulfilling," or whether they "love and care for others" (p. 21).

Several recent efforts have emerged in response to both the relative lack of emphasis on measuring positive outcomes, and the lack of a common core of measures to be used across positive youth development studies. For example, Search Institute, the Institute for Applied Research in Youth Development at Tufts University, and the Fuller Theological Seminary, with strategic consultation from Stanford University and the Thrive Foundation for Youth, recently embarked on a multiyear "Thriving Indicator Project" with the goal of producing effective measurement tools and resources on thriving that would be widely used and developed from a foundation of deep science.

Initial activities have included a comprehensive review of the literature on thriving and related concepts, and interviews with scholars, positive youth development practitioners, youth, and their parents that elicited their views on what describes a thriving youth (King et al., in press). A group of core dimensions of thriving is emerging (e.g., Theokas et al., in press) that will then serve as a lens to help focus development of thriving measurement tools to be used in clinical, programmatic, community change, and national tracking applications.

A similar effort, with the goal of developing and embedding common measures of positive youth development outcomes in state and federal data tracking systems, is being led by Child Trends. Scholars and policymakers are recommending reliable, valid, and relatively brief measures in areas such as prosocial orientation, religiosity, and social competencies (Moore & Lippman, 2004) that could help track developmental strengths and contribute to a long-term re-shaping of child and youth policy.

CONCLUSIONS

Despite differences in terminology and comprehensiveness, the similarities across models of positive youth development are apparent, and a substantial body of research supports the hypotheses emerging from the

melding of positive youth development practice and a variety of developmental and other theories. Positive youth development is both caused and indicated by whether a young person experiences adequate supports and opportunities. Doing so consistently and in multiple settings is particularly important. These experiences help them develop key competencies, skills, values, and self-perceptions that adaptively self-regulating persons need in order to successfully shape and navigate life over time.

There are multiple sources of those developmental nutrients or assets, including the proactive influence of young people on their own environments. Not just genetic heritage, not just family, not just schools, congregations, peers, or any other influence create a young person's developmental path, but all do so operating together, interactively, to form a system larger than the sum of those parts. In practical terms, the research findings that support this conclusion lead to two inevitable implications.

First, isolated programs working to change individual youth without changing the environments in which they live may have some limited, short-term success, but cannot be expected to support significant long-term positive development, or especially, to radically alter the developmental path of particularly vulnerable young people. Multiple contexts of young people's lives need to be strengthened simultaneously to promote the systemic supports needed for sustained and widespread positive development among all youth.

Second, the nesting of young people in families and schools within neighborhoods and communities and wider society means that a long-term commitment to significant community mobilization around common norms, values, and goals related to positive youth development is essential. No less an effort will attain the breadth, depth, and permeation of culture with both formal and informal daily life to profoundly change the developmental odds for a critical mass of America's young people.

Though research supports the efficacy of positive youth development as an approach for changing these developmental odds, it is also clear that other approaches are necessary. Poverty, family violence, and abuse are among a litany of risks that jeopardize development. It is likely that reducing risks and promoting assets can be complimentary strategies for enhancing positive developmental outcomes. Theory and research is needed to better understand the interplay of risks and assets. In addition, it is important to identify how combinations of risk reduction and asset-building intervention strategies work for youth in various social locations.

One of the major contributions of positive youth development theory and research is the identification of the multiple contexts and settings that inform developmental trajectories. As an applied field, positive youth development and its advocates face crucial decision points about how and where to create intentional change. Though the development of and/or enrichment of programs is the primary locus of intervention, theory and research also identify a much wider range of possibilities. Access to developmental assets could also be advanced by, for example, transforming socializing systems (e.g., schools and neighborhoods) or mobilizing adults to create sustained relationships with community youth.

It is here in this complex space of community and societal change where new thinking is particularly needed. As noted at several points in this chapter, the least developed part of positive youth development theory is that having to do with how intentional change can best be understood (and practiced). The complexity of this issue (as well as the societal importance of promoting positive development) requires an interdisciplinary approach, integrating multiple fields in common pursuit of how to enhance the dynamic fusion of ecological- and individual-level strengths.

This interdisciplinary research agenda should initially focus on developmental contexts as the unit of analysis with inquiry into the strategies that enhance the capacity and will of schools, neighborhoods, families, and congregations to nurture developmental strengths. And such inquiry will necessarily lead to important research issues regarding the orchestration of change at multiple levels, including the strategies for creating developmentally attentive communities. Consonant with the theory of positive development, we hypothesize that the most successful transformation in contexts and community will occur when youth are at the forefront in planning and implementing the change initiative.

REFERENCES

Allen, J. P., Philliber, S., Herrling, S., & Kuperminc, G. P. (1997). Preventing teen pregnancy and academic failure: Experimental evaluation of a developmentally based approach. *Child Development, 68,* 729–742.

Anthony, E. J. (1974). The syndrome of the psychologically vulnerable child. In E. J. Anthony & B. J. Cohler (Eds.), *The invulnerable child* (pp. 103–148). New York: Guilford Press.

Atkins, R., & Hart, D. (2003). Neighborhoods, adults, and the development of civic identity in urban youth. *Applied Developmental Science, 7,* 156–165.

Baltes, P. B., & Baltes, M. M. (1990). Psychological perspectives on successful aging: The model of selective optimization with compensation. In P. B. Baltes & M. M. Baltes (Eds.), *Successful aging: Perspectives from the behavioral sciences* (pp. 1–34). New York: Cambridge University Press.

Baltes, P. B., Dittmann-Kohli, F., & Dixon, R. A. (1984). New perspectives on the development of intelligence in adulthood: Toward a dual-process conception and a model of selective optimization with compensation. In P. B. Baltes & O. G. Brim (Eds.), *Life-span development and behavior* (Vol. 6, pp. 33–76). Orlando, FL: Academic Press.

Baltes, P. B., & Freund, A. M. (2003). Human strengths as the orchestration of wisdom and selective optimization with compensation. In L. G. Aspinwall & U. M. Staudinger (Eds.), *A psychology of human strengths: Fundamental questions and future directions for a positive psychology* (pp. 23–36). Washington, DC: American Psychological Association.

Baltes, P. B., Lindenberger, U., & Staudinger, U. M. (1998). Life-span theory in developmental psychology. In W. Damon & R. M. Lerner (Eds.), *Handbook of child psychology* (pp. 1029–1143). New York: Wiley.

Bean, R. A., Bush, K. R., McKenry, P. C., & Wilson, S. M. (2003). The impact of parental support, behavioral control, and psychological control on the academic achievement and self-esteem of African American and European American adolescents. *Journal of Adolescent Research, 18,* 523–541.

Benson, P. L. (1990). *The troubled journey: A portrait of 6th to 12th grade youth.* Minneapolis, MN: Search Institute.

Benson, P. L. (1997). *All kids are our kids: What communities must do to raise caring and responsible children and adolescents.* San Francisco: Jossey-Bass.

Benson, P. L. (2002). Adolescent development in social and community context: A program of research. *New Directions for Youth Development, 95,* 123–147.

Benson, P. L. (2003a). Developmental assets and asset-building community: Conceptual and empirical foundations. In R. M. Lerner & P. L. Benson (Eds.), *Developmental assets and asset-building communities: Implications for research, policy, and practice* (pp. 19–43). New York: Kluwer Academic/Plenum Press.

Benson, P. L. (2003b). Toward asset-building communities: How does change occur. In R. M. Lerner & P. L. Benson (Eds.), *Developmental assets and asset-building communities: Implications for research, policy, and practice* (pp. 213–221). New York: Kluwer Academic/Plenum Press.

Benson, P. L., & Leffert, N. (2001). Childhood and adolescence: Developmental assets. In N. J. Smelser & P. G. Baltes (Eds.), *International encyclopedia of the social and behavioral sciences* (pp. 1690–1697). Oxford, England: Pergamon Press.

Benson, P. L., Leffert, N., Scales, P. C., & Blyth, D. A. (1998). Beyond the "village" rhetoric: Creating healthy communities for children and adolescents. *Applied Developmental Science, 2*(3), 138–159.

Benson, P. L., Mannes, M., Pittman, K., & Ferber, T. (2004). Youth development, developmental assets and public policy. In R. M. Lerner & L. Steinberg (Eds.), *Handbook of adolescent psychology* (2nd ed., pp. 781–814). New York: Wiley.

Benson, P. L., & Pittman, K. (2001a). Moving the youth development message: Turning a vague idea into a moral imperative. In P. L. Benson & K. J. Pittman (Eds.), *Trends in youth development: Visions, realities, and challenges* (pp. vii–xii). Norwell, MA: Kluwer Academic.

Benson, P. L., & Pittman, K. (2001b). *Trends in youth development: Visions, realities, and challenges.* Norwell, MA: Kluwer Academic.

Benson, P. L., & Roehlkepartain, E. C. (2004). Preventing alcohol, tobacco, and other drug use: Rethinking the role of community. *Search Institute Insights and Evidence, 2*(1), 5.

Benson, P. L., & Saito, R. N. (2001). The scientific foundations of youth development. In P. L. Benson & K. J. Pittman (Eds.), *Trends in youth development: Visions, realities, and challenges* (pp. 135–154). Norwell, MA: Kluwer Academic.

Benson, P. L., Scales, P., Leffert, N., & Roehlkepartain, E. (1999). *The fragile foundation: The state of developmental assets among American youth.* Minneapolis, MA: Search Institute.

Benson, P. L., Scales, P. C., & Mannes, M. (2003). Developmental strengths and their sources: Implications for the study and practice of community building. In R. M. Lerner, F. Jacobs, & D. Wertlieb (Eds.), *Handbook of applied developmental science: Vol. 1. Promoting positive child, adolescent, and family development through research, policies and programs—Applying developmental science for youth and families: Historical and theoretical foundations* (pp. 369–406). Newbury Park, CA: Sage.

Berkowitz, W. (2001). Studying outcomes of community-based coalitions. *American Journal of Community Psychology, 29,* 213–239.

Bloom, M. (1996). *Primary prevention practices.* Thousand Oaks, CA: Sage.

Blum, R. W., Beuhring, T., & Rinehart, P. M. (2000). *Protecting teens: Beyond race, income, and family structure.* Minneapolis, MN: University of Minnesota, Center for Adolescent Health.

Blum, R. W., & Ellen, J. (2002). Work group V: Increasing the capacity of schools, neighborhoods, and communities to improve adolescent health outcomes. *Journal of Adolescent Health, 31*(Suppl. 6), 288–292.

Blyth, D. A. (2001). Community approaches to improving outcomes for urban children, youth, and families. In A. Booth & A. C. Crouter (Eds.), *Does it take a village? Community effects on children, adolescents, and families* (pp. 223–227). Mahwah, NJ: Erlbaum.

Bogenschneider, K., Small, S. A., & Tsay, J. C. (1997). Child, parent, and contextual influences on perceived parenting competence among parents of adolescents. *Journal of Marriage and the Family, 59,* 345–362.

Booth, A., & Crouter, A. C. (2001). *Does it take a village? Community effects on children, adolescents, and families.* Mahwah, NJ: Erlbaum.

Brandtstadter, J. (1998). Action perspectives on human development. In W. Damon (Editor-in-Chief) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 807–863). New York: Wiley.

Brandtstadter, J. (1999). *Action and self-development: Theory and research through the lifespan.* Thousand Oaks, CA: Sage.

Brody, G. H., Dorsey, S., Forehand, R., & Armistead, L. (2002). Unique and protective contributions of parenting and classroom processes to the adjustment of African American children living in single-parent families. *Child Development, 73*(1), 274–286.

Bronfenbrenner, U. (1979). *The ecology of human development.* Cambridge, MA: Harvard University Press.

Bronfenbrenner, U., & Morris, P. (1998). The ecology of developmental processes. In W. Damon (Editor-in-Chief) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 993–1028). New York: Wiley.

Bruner, J. S. (1983). *Child's talk: Learning to use language.* New York: Norton.

Bumbarger, B., & Greenberg, M. T. (2002). Next steps in advancing research on positive youth development. *Prevention and Treatment, 5*(16).

Caplan, G. (1964). *Principles of preventive psychiatry.* New York: Basic Books.

Carnegie Corporation of New York. (1992). *A matter of time: Risk and opportunity in the non-school hours.* Waldorf, MD: Carnegie Council on Adolescent Development.

Carnegie Council on Adolescent Development. (1995). *Great transitions: Preparing adolescents for a new century.* New York: Carnegie Corporation of New York.

Catalano, R. F., Berglund, M. L., Ryan, J. A., Lonczak, H. S., & Hawkins, J. D. (1999). *Positive youth development in the United States: Research findings on evaluations of positive youth development programs.* Seattle, WA: Social Development Research Group.

Catalano, R. F., Berglund, M. L., Ryan, J. A. M., Lonczak, H. S., & Hawkins, J. D. (2004). Positive youth development in the United States: Research findings on evaluations of positive youth development programs. *Annals of the American Academy of Political and Social Science, 591,* 98–124.

Catalano, R. F., & Hawkins, J. D. (2002). Response from authors to comments on "Positive youth development in the United States: Research findings on evaluations of positive youth development programs." *Prevention and Treatment, 5*(article 20).

Catalano, R. F., Hawkins, J. D., Berglund, M. L., Pollard, J. A., & Arthur, M. W. (2002). Prevention science and positive youth development: Competitive or cooperative frameworks? *Journal of Adolescent Health, 31,* 230–239.

Catalano, R. F., & Kosterman, R. (1996). Modeling the etiology of adolescent substance use: A test of the social development model. *Journal of Drug Issues, 26*(2), 429–456.

Catalano, R. F., Mazza, J. J., Harachi, T. W., Abbott, R. D., Haggerty, K. P., & Fleming, C. B. (2003). Raising healthy children through enhancing social development in elementary school: Results after 1.5 years. *Journal of School Psychology, 41*(2), 143–164.

Catterall, J. S. (1998). Risk and resilience in student transitions to high school. *American Journal of Education, 106*(2), 302–334.

Chess, S., & Thomas, A. (1999). *Goodness of fit: Clinical applications from infancy through adult life.* Philadelphia: Brunner/Mazel.

Coleman, J. S. (1990). *Foundations of social theory.* Cambridge, MA: Belknap Press.

Collins, W. A., Maccoby, E. E., Steinberg, L., Heatherington, E. M., & Bornstein, M. (2000). Contemporary research on parenting: The case for nature and nurture. *American Psychologist, 55,* 218–232.

Comer, J. (1980). *School power.* New York: Free Press.

Comer, J. P., Haynes, N. M., Joyner, E. T., & Ben-Avie, M. (1996). *Rallying the whole village: The Comer process for reforming education.* New York: Teachers College Press.

Conger, R. D., & Conger, K. J. (2002). Resilience in Midwestern families: Selected findings from the first decade of a prospective, longitudinal study. *Journal of Marriage and Family, 64,* 361–373.

Connell, J. P., Gambone, M. A., & Smith, T. J. (2001). Youth development in community settings: Challenges to our field and our approach. In P. L. Benson & K. J. Pittman (Eds.), *Trends in youth development: Visions, realities, and challenges* (pp. 291–307). Boston: Kluwer Academic.

Connell, J. P., & Kubisch, A. C. (2001). Community approaches to improving outcomes for urban children, youth, and families: Current trends and future directions. In A. Booth & A. C. Crouter (Eds.), *Does it take a village? Community effects on children, adolescents, and families* (pp. 177–201). Mahwah, NJ: Erlbaum.

Connell, J. P., Kubisch, A. C., Schorr, L. B., & Weiss, C. H. (1995). *New approaches to evaluating community initiatives: Concepts, methods, and contexts.* Washington, DC: Aspen Institute.

Cook, T. D., Herman, M. R., Phillips, M., & Settersten, R. A., Jr. (2002). Some ways in which neighborhoods, nuclear families, friendship groups, and schools jointly affect changes in early adolescent development. *Child Development, 73,* 1283–1309.

Crosnoe, R., Erickson, K. G., & Dornbusch, S. (2002). Protective functions of family relationships and school factors on the deviant behavior of adolescent boys and girls: Reducing the impact of risky friendships. *Youth and Society, 33*(4), 515–544.

Csikszentmihalyi, M. (1990). *Flow: The psychology of optimal experience.* New York: Harper-Collins.

Damon, W. (1997). *The youth charter: How communities can work together to raise standards for all our children.* New York: Free Press.

Damon, W. (2004). What is positive youth development? *Annals of the American Academy of Political and Social Science, 591*(1), 13–24.

Damon, W., & Gregory, A. (2003). Bringing in a new era in the field of youth development. In R. M. Lerner & P. L. Benson (Eds.), *Developmental assets and asset-building communities: Implications for research, policy, and practice* (pp. 47–64). New York: Kluwer Academic/Plenum Press.

Davey, M., Eaker, D. G., & Walters, L. H. (2003). Resilience processes in adolescents: Personality profiles, self-worth, and coping. *Journal of Adolescent Research, 18*(4), 347–362.

Dishion, T. J., Andrews, D. W., & Crosby, L. (1995). Antisocial boys and their friends in adolescence: Relationship characteristics, quality and interactional processes. *Child Development, 66,* 139–151.

Dorgan, K. A., & Ferguson, R. F. (2004). Success factors in community-wide initiatives for youth development. In S. F. Hamilton & M. A. Hamilton (Eds.), *The youth development handbook: Coming of age in American communities* (pp. 271–300). Thousand Oaks, CA: Sage.

Dryfoos, J. G. (1990). *Adolescents at risk: Prevalence and prevention.* New York: Oxford University Press.

Dryfoos, J. G. (1998). *Safe passage: Making it through adolescence in a risky society.* New York: Oxford University Press.

DuBois, D. L., Holloway, B. E., Valentine, J. C., & Cooper, H. (2002). Effectiveness of mentoring programs for youth: A meta-analytic review. *American Journal of Community Psychology, 30,* 157–197.

Dubow, E. F., Arnett, M., Smith, K., & Ippolito, M. F. (2001). Predictors of future expectations of inner-city children: A 9-month prospective study. *Journal of Early Adolescence, 21*(1), 5–28.

Dukes, R., & Stein, J. (2001). Effects of assets and deficits on the social control of at risk behavior among youth. *Youth and Society, 32*(3), 337–360.

Durlak, J. A. (1998). Common risk and protective factors in successful prevention programs. *American Journal of Orthopsychiatry, 68*(4), 512–520.

Durlak, J. A., & Wells, A. M. (1997). Primary prevention mental health programs: A meta-analytic review. *American Journal of Community Psychology, 25*(2), 115–153.

Dworkin, J. B., Larson, R., & Hansen, D. (2003). Adolescents' accounts of growth experiences in youth activities. *Journal of Youth and Adolescence, 32,* 17–26.

Earls, F., & Carlson, M. (2001). The social ecology of child health and well-being. *Annual Review of Public Health, 22,* 143–166.

Earls, F., & Carlson, M. (2002). Adolescents as collaborators: In search of well-being. In M. Tienda & W. J. Wilson (Eds.), *Youth in cities: A cross-national perspective* (pp. 58–83) . New York: Cambridge University Press.

Eccles, J. S. (1997). User-friendly science and mathematics: Can it interest girls and minorities in breaking through the middle school wall. In D. Johnson (Ed.), *Minorities and girls in school: Effects on achievement and performance: Vol. 1. Leaders in psychology* (pp. 65–104). Thousand Oaks, CA: Sage.

Eccles, J. S., & Barber, B. L. (1999). Student council, volunteering, basketball, or marching band: What kind of extracurricular involvement matters? *Journal of Adolescent Research, 14*(1), 10–43.

Eccles, J. S., Early, D., Frasier, K., Belansky, E., & McCarthy, K. (1997). The relation of connection, regulation, and support for autonomy to adolescents' functioning. *Journal of Adolescent Research, 12,* 263–286.

Eccles, J. S., & Harold, R. D. (1996). Family involvement in children's and adolescents' schooling. In A. Booth & J. F. Dunn (Eds.), *Family-school links: How do they affect educational outcomes?* (pp. 3–34). Mahwah, NJ: Erlbaum.

Eisenberg, N., & Fabes, R. A. (1998). Meta-analysis of age and sex differences in children's and adolescents' prosocial behavior. In W. Damon (Editor-in-Chief) & N. Eisenberg (Vol. Ed.), *Handbook of child psychology: Vol. 3. Social, emotional, and personality development* (5th ed., pp. 701–778). New York: Wiley.

Elder, G. H., Jr. (1974). *Children of the great depression.* Chicago: University of Chicago Press.

Elder, G. H., Jr. (1980). Adolescence in historical perspective. In J. Adelson (Ed.), *Handbook of adolescent psychology* (pp. 3–46). New York: Wiley.

Elder, G. H., Jr. (1998). The life course and human development. In W. Damon (Editor-in-Chief) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 939–991). New York: Wiley.

Elder, G. H., Jr. (1999). *Children of the great depression: Social change in life experience* (25th anniv. ed.). Boulder, CO: Westview Press.

Feshbach, N. (1983). Sex differences in empathy and social behavior in children. In N. Eisenberg (Ed.), *The development of prosocial behavior* (pp. 11–47). New York: Academic Press.

Ford, D. H., & Lerner, R. M. (1992). *Developmental systems theory: An integrative approach.* Newbury Park, CA: Sage.

Fukuyama, F. (1999). *The great disruption: Human nature and the reconstitution of social order.* New York: Free Press.

Furlong, M., Paige, L. Z., & Osher, D. (2003). The Safe Schools/Healthy Students (SS/HS) Initiative: Lessons learned from implementing comprehensive youth development programs. *Psychology in the Schools, 40,* 447–456.

Furstenberg, F. F., Jr. (2000). The sociology of adolescence and youth in the 1990s: A critical commentary. *Journal of Marriage and the Family, 62,* 896–910.

Furstenberg, F. F., Jr., Modell, J., & Herschberg, T. (1976). Social change and transitions to adulthood in historical perspective. *Journal of Family History, 1*(1), 7–32.

Galambos, N., & Turner, P. (1999). Parent and adolescent temperament and the quality of parent-adolescent relations. *Merrill-Palmer Quarterly, 45,* 493–511.

Gambone, M. A., & Arbreton, A. J. A. (1997). *Safe havens: The contributions of youth organizations to healthy adolescent development.* Philadelphia: Public/Private Ventures.

Gambone, M. A., Klem, A. M., & Connell, J. P. (2002). *Finding out what matters for youth: Testing key links in a community action framework for youth development.* Philadelphia: Youth Development Strategies and Institute for Research and Reform in Education.

Garbarino, J. (1995). *Raising children in a socially toxic environment.* San Francisco: Jossey-Bass.

Garmezy, N. (1983). *Stress, coping and development in children.* New York: McGraw-Hill.

Gerard, J. M., & Buehler, C. (2004). Cumulative environmental risk and youth problem behavior. *Journal of Marriage and the Family, 66,* 702–720.

Goldfried, M. R., & Bell, A. C. (2003). Extending the boundaries of research on adolescent development. *Journal of Clinical Child and Adolescent Psychology, 32,* 531–535.

Gottlieb, G. (1997). *Synthesizing nature-nurture: Prenatal roots of instinctive behavior.* Mahwah, NJ: Erlbaum.

Gottlieb, G., Wahlsten, D., & Lickliter, R. (1998). The significance of biology for human development: A developmental psychobiological systems view. In W. Damon (Editor-in-Chief) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 233–273). New York: Wiley.

Granger, R. C. (2002). Creating the conditions linked to positive youth development. *New Directions for Youth Development, 95,* 149–164.

Greenberg, M. T., Weissberg, R. P., O'Brien, M. U., Zins, J. E., Fredericks, L., Resnick, H., et al. (2003). Enhancing school-based prevention and youth development through coordinated social, emotional, and academic learning. *American Psychologist, 58*(6/7), 466–474.

Gutman, L. M., & Midgley, C. (2000). The role of protective factors in supporting the academic achievement of poor African American students during the middle school transition. *Journal of Youth and Adolescence, 29*(2), 223–248.

Gutman, L. M., Sameroff, A. J., & Eccles, J. S. (2002). The academic achievement of African American students during early adolescence: An examination of multiple risk, promotive, and protective factors. *American Journal of Community Psychology, 30*(3), 367–399.

Hahn, A., & Lanspery, S. (2001). *Change that abides: A retrospective look at five community and family strengthening projects, and their enduring results.* Waltham, MA: Brandeis University.

Halfon, N. (2003). Afterword: Toward an asset-based policy agenda for children, families, and communities. In R. M. Lerner & P. L. Benson (Eds.), *Developmental assets and asset-building communities: Implications for research, policy, and practice* (pp. 223–229). New York: Kluwer Academic/Plenum Press.

Hamburg, D. A., & Takanishi, R. (1996). Great transitions: Preparing American youth for the 21st century—The role of research. *Journal of Research on Adolescence, 6*(4), 379–396.

Hamilton, S. (1999). *A three-part definition of youth development.* Unpublished manuscript, Cornell University College of Human Ecology, Ithaca, NY.

Hamilton, S. F., & Hamilton, M. A. (2004). *The youth development handbook: Coming of age in American communities.* Thousand Oaks, CA: Sage.

Hamilton, S. F., Hamilton, M. A., & Pittman, K. (2004). Principles for youth development. In S. F. Hamilton & H. M. A. Hamilton (Eds.), *The youth development handbook: Coming of age in American communities* (pp. 3–22). Thousand Oaks, CA: Sage.

Havighurst, R. J. (1953). *Human development and education.* London: Longmans, Green.

Hawkins, J. D., & Catalano, R. F. (1996). *Parents who care: A step-by-step guide for families with teens.* San Francisco: Jossey-Bass/Pfeiffer.

Heckhausen, J. (1999). *Developmental regulation in adulthood: Age-normative and sociocultural constraints as adaptive challenges.* New York: Cambridge University Press.

Heckhausen, J., & Krueger, J. (1993). Developmental expectations for the self and most other people: Age grading in three functions of social comparison. *Developmental Psychology, 29,* 539–548.

Heckhausen, J., & Schulz, R. (1995). A life-span theory of control. *Psychological Review, 102,* 284–304.

Hein, K. (2003). Enhancing the assets for positive youth development: The vision, values, and action agenda of the W. T. Grant Foundation. In R. M. Lerner & P. L. Benson (Eds.), *Developmental assets and asset-building communities: Implications for research, policy, and practice* (pp. 97–117). New York: Kluwer Academic/Plenum Press.

Hoffman, M. L. (2000). *Empathy and moral development: Implications for caring and justice.* New York: Cambridge University Press.

Hollister-Wagner, G. H., Foshee, V. A., & Jackson, C. (2001). Adolescent aggression: Models of resiliency. *Journal of Applied Social Psychology, 31*(3), 445–466.

Huebner, A. J., & Betts, S. C. (2002). Exploring the utility of social control theory for youth development: Issues of attachment, involvement, and gender. *Youth and Society, 34*(2), 123–145.

Hughes, D., & Curnan, S. P. (2000). Community youth development: A framework for action. *CYD Journal, 1*(1), 7–13.

Hunter, J. P., & Csikszentmihalyi, M. (2003). The positive psychology of interested adolescents. *Journal of Youth and Adolescence, 32,* 27–35.

Hyman, J. B. (2002). Exploring social capital and civic engagement to create a framework for community building. *Applied Developmental Science, 6*(4), 196–202.

Jessor, R. (1993). Successful adolescent development among youth in high-risk settings. *American Psychologist, 48*(2), 117–126.

Jessor, R., Turbin, M. S., & Costa, F. M. (1998). Risk and protection in successful outcomes among disadvantaged adolescents. *Applied Developmental Science, 2*(4), 194–208.

Jessor, R., Van Den Bos, J., Vanderryn, J., Costa, F. M., & Turbin, M. S. (1995). Protective factors in adolescent problem behavior: Moderator effects and developmental change. *Developmental Psychology, 31*(6), 923–933.

Keyes, C. L. M. (2003). Complete mental health: An agenda for the 21st century. In C. L. M. Keyes & J. Haidt (Eds.), *Flourishing: Positive psychology and the life well-lived* (pp. 293–312). Washington, DC: American Psychological Association.

King, P. E., Dowling, E. M., Mueller, R. A., White, K., Schultz, W., Osborn, P., et al. (in press). Thriving in adolescence: The voices of youth-serving practitioners, parents, and early and late adolescents. *Journal of Early Adolescence.*

Kreipe, R. E., Ryan, S. A., & Seibold-Simpson, S. M. (2004). Youth development and health. In S. F. Hamilton & M. A. Hamilton (Eds.), *The youth development handbook: Coming of age in American communities* (pp. 103–126). Thousand Oaks, CA: Sage.

Kretzmann, J., & McKnight, J. (1993). *Building communities from the inside out: A path toward finding and mobilizing a community's assets.* Chicago: ACTA Publication.

Larson, R. W. (2000). Toward a psychology of positive youth development. *American Psychologist, 55*(1), 170–183.

Leffert, N., Benson, P. L., & Roehlkepartain, J. L. (1997). *Starting out right: Developmental assets for children.* Minneapolis, MN: Search Institute.

Leffert, N., Benson, P. L., Scales, P. C., Sharma, A. R., Drake, D. R., & Blyth, D. A. (1998). Developmental assets: Measurement and prediction of risk behaviors among adolescents. *Applied Developmental Science, 2*(4), 209–230.

Lerner, R. M. (1976). *Concepts and theories of human development.* Reading, MA: Addison-Wesley.

Lerner, R. M. (1984). *On the nature of human plasticity.* New York: Cambridge University Press.

Lerner, R. M. (1995). *America's youth in crisis: Challenges and options for programs and policies.* Thousand Oaks, CA: Sage.

Lerner, R. M. (1998). Theories of human development: Contemporary perspectives. In W. Damon (Editor-in-Chief) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 1–24). New York: Wiley.

Lerner, R. M. (2000). Developing civil society through the promotion of positive youth development. *Journal of Developmental and Behavioral Pediatrics, 21,* 48–49.

Lerner, R. M. (2002). *Concepts and theories of human development* (3rd ed.). Mahwah, NJ: Erlbaum.

Lerner, R. M. (2003). Developmental assets and asset-building communities: A view of the issues. In R. M. Lerner & P. L. Benson (Eds.), *Developmental assets and asset-building communities: Implications for research, policy, and practice* (pp. 3–18). New York: Kluwer Academic/Plenum Press.

Lerner, R. M. (2004). *Liberty: Thriving and civic engagement among America's youth.* Thousand Oaks, CA: Sage.

Lerner, R. M., Anderson, P. M., Balsano, A. B., Dowling, E. M., & Bobek, D. L. (2003). Applied developmental science of positive human development. In R. M. Lerner, M. A. Easterbrooks, & J. Mistry (Eds.), *Handbook of psychology: Vol. 6. Developmental psychology* (pp. 535–558). New York: Wiley.

Lerner, R. M., & Benson, P. L. (2003). *Developmental assets and asset-building communities: Implications for research, policy, and practice.* Norwell, MA: Kluwer Academic.

Lerner, R. M., Brentano, C., Dowling, E. M., & Anderson, P. M. (2002). Positive youth development: Thriving as the basis of personhood and civil society. *New Directions for Youth Development: Pathways to Positive Development Among Diverse Youth, 95,* 11–33.

Lerner, R. M., Dowling, E. M., & Anderson, P. M. (2003). Positive youth development: Thriving as the basis of personhood and civil society. *Applied Developmental Science, 7*(3), 172–180.

Lerner, R. M., Fisher, C. B., & Weinberg, R. A. (2000). Toward a science for and of the people: Promoting civil society through the application of developmental science. *Child Development, 71,* 11–20.

Lerner, R. M., Freund, A. M., De Stefanis, I., & Habermas, T. (2001). Understanding developmental regulation in adolescence: The use of the selection, optimization, and compensation model. *Human Development, 44,* 29–50.

Lerner, R. M., Lerner, J. V., Alermigi, J., Theokas, C., Phelps, E., Gestsdottir, S., et al. (in press). Positive youth development, participation in community youth development programs, and community contributions of fifth grade adolescents: Findings from the first wave of the 4-H Study of Positive Youth Development. *Journal of Early Adolescence.*

Lerner, R. M., Lerner, J. V., De Stefanis, I., & Apfel, A. (2001). Understanding developmental systems in adolescence: Implications for methodological strategies, data analytic approaches, and training. *Journal of Adolescent Research, 16,* 9–27.

Lerner, R. M., Wertlieb, D., & Jacobs, F. (2003). Historical and theoretical bases of applied developmental science. In R. M. Lerner, D. Wertlieb, & F. Jacobs (Eds.), *Handbook of applied developmental science: Vol. 1. Applying developmental science for youth and families—Historical and theoretical foundations* (pp. 1–28). Thousand Oaks, CA: Sage.

Li, X., Stanton, B., Pack, R., Harris, C., Cottrell, L., & Burns, J. (2002). Risk and protective factors associated with gang involvement among urban African American adolescents. *Youth and Society, 34*(2), 172–194.

Lonczak, H. S., Abbott, R. D., Hawkins, J. D., Kosterman, R., & Catalano, R. F. (2002). Effects of the Seattle Social Development Project on sexual behavior, pregnancy, birth, and sexually transmitted disease outcomes by age 21 years. *Archives of Pediatric and Adolescent Medicine, 156,* 438–447.

Lorenz, K. (1965). *Evolution and modification of behavior.* Chicago: University of Chicago Press.

Lorion, R. P., & Sokoloff, H. (2003). Building assets in real-world communities. In R. M. Lerner & P. L. Benson (Eds.), *Developmental assets and asset-building communities* (pp. 121–156). New York: Kluwer Academic.

Luthar, S. S., Cicchetti, D., & Becker, B. (2000). The construct of resilience: A critical evaluation and guidelines for future work. *Child Development, 71*(3), 543–562.

MacDonald, G. B., & Valdivieso, R. (2001). Measuring deficits and assets: How we track youth development now, and how we should track it. In P. L. Benson & K. J. Pittman (Eds.), *Trends in youth development: Visions, realities, and challenges* (pp. 155–186). Boston: Kluwer Press.

Maddox, S. J., & Prinz, R. J. (2003). School bonding in children and adolescents: Conceptualization, assessment, and associated variables. *Clinical Child and Family Psychology Review, 6*(1), 31–49.

Madsen, M. C. (1971). Developmental and cross-cultural differences in the cooperative and competitive behavior of young children. *Journal of Cross-Cultural Psychology, 2,* 365–371.

Mahoney, J. L., Cairns, B. D., & Farmer, T. W. (2003). Promoting interpersonal competence and educational success through extracurricular activity participation. *Journal of Educational Psychology, 95,* 409–418.

Mannes, M., Benson, P. L., Kretzmann, J., & Norris, T. (2003). The American tradition of community development: Implications for guiding community engagement in youth development. In R. M. Lerner, F. Jacobs, & D. Wertlieb (Eds.), *Handbook of applied developmental science: Promoting positive child, adolescent, and family development through research, policies and programs: Vol. 1. Applying developmental science for youth and families—Historical and theoretical foundations* (pp. 469–499). Newbury Park, CA: Sage.

Mannes, M., Lewis, S., Hintz, N., Foster, K., & Nakkula, M. (2002). *Cultivating developmentally attentive communities: A report on the first wave of the National Asset-Building Case Study Project.* Minneapolis, MN: Search Institute.

Masten, A. S. (2001). Ordinary magic: Resilience processes in development. *American Psychologist, 56,* 227–238.

Masten, A. S., & Coatsworth, J. D. (1998). The development of competence in favorable and unfavorable environments: Lessons from research on successful children. *American Psychologist, 53*(2), 205–220.

Masten, A. S., & Garmezy, N. (1985). Risk, vulnerability and protective factors in developmental psychology. In B. B. Lahey & A. E. Kazdin (Eds.), *Advances in child clinical psychology* (Vol. 8, pp. 1–52). New York: Plenum Press.

Masten, A. S., Hubbard, J. J., Gest, S. D., Tellegen, A., Garmezy, N., & Ramirez, M. L. (1999). Competence in the context of adversity: Pathways to resilience and maladaptation from childhood to late adolescence. *Development and Psychopathology, 11,* 143–169.

McLaughlin, M. W., Irby, M. A., & Langman, J. (1994). *Urban sanctuaries: Neighborhood organizations in the lives and futures of inner-city youth.* San Francisco: Jossey-Bass.

McLellan, J. A., & Youniss, J. (2003). Two systems of youth service: Determinants of voluntary and required youth community service. *Journal of Youth and Adolescence, 32,* 47–58.

Metz, E., McLellan, J., & Youniss, J. (2003). Types of voluntary service and adolescents' civic development. *Journal of Adolescent Research, 18,* 188–203.

Miller, W. R., & Thoresen, C. E. (2003). Spirituality, religion, and health: An emerging research field. *American Psychologist, 58,* 24–35.

Moffitt, T. E. (1993). Life-course-persistent and adolescence-limited antisocial behavior: A developmental taxonomy. *Psychological Review, 100,* 674–701.

Montemayor, R., Adams, G. R., & Gullotta, T. P. (2000). *Advances in adolescent development: Vol. 10. Adolescent diversity in ethnic, economic, and cultural contexts.* Thousand Oaks, CA: Sage.

Moore, K. A. (1997). Criteria for indicators of child well-being. In R. M. Hauser, B. V. Brown, & W. R. Prosser (Eds.), *Indicators of children's well-being* (pp. 36–44). New York: Russell Sage Foundation.

Moore, K. A., & Glei, D. (1995). Taking the plunge: An examination of positive youth development. *Journal of Adolescent Research, 10*(1), 15–40.

Moore, K. A., & Lippman, L. (2004). *What do children need to flourish? Conceptualizing and measuring indicators of positive development.* New York: Kluwer Academic/Plenum Press.

Moore, K. A., Lippman, L., & Brown, B. (2004). Indicators of child well-being: The promise for positive youth development. *The Annals of the American Academy of Political and Social Science, 591,* 125–147.

Mortimer, J., & Larson, R. (2002). *The changing adolescent experience: Societal trends and the transition to adulthood.* New York: Cambridge University Press.

Munóz, R. F., Mrazek, P. J., & Haggerty, R. J. (1996). Institute of Medicine report on prevention of mental disorders: Summary and commentary. *American Psychologist, 51*(11), 1116–1122.

Nakamura, J. (2001). The nature of vital engagement in adulthood. In M. Michaelson & J. Nakamura (Eds.), *Supportive frameworks for youth engagement: New directions for child and adolescent development, No. 93.* San Francisco: Jossey-Bass.

National Research Council and Institute of Medicine. (2002). *Community programs to promote youth development: Committee on community-level programs for youth* (J. Eccles & J. A. Gootman, Eds.) [Division of Behavioral and Social Sciences and Education, Board on Children, Youth and Families]. Washington, DC: National Academy Press.

Nesselroade, J. R. (1977). Issues in studying developmental change in adults from a multivariate perspective. In J. E. Birren & K. W. Schaie (Eds.), *Handbook of the psychology of aging* (pp. 59–69). New York: Van Nostrand Reinhold.

O'Donnell, L., Stueve, A., San Doval, A., Duran, R., Atnafou, R., Haber, D., et al. (1999). Violence prevention and young adolescents' participation in community youth service—Implications for intervention. *Journal of Adolescent Health, 24*(1), 28–37.

O'Donoghue, J. L., Kirshner, B., & McLaughlin, M. (2002). Introduction: Moving youth participation forward. *New Directions for Youth Development, 96,* 15–26.

Overton, W. F. (1998). Developmental psychology: Philosophy, concepts, and methodology. In W. Damon (Editor-in-Chief) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 107–187). New York: Wiley.

Pancer, M., Rose-Krasnor, L., & Loiselle, L. (2002). Youth conferences as a context for engagement. *New Directions for Youth Development, 96,* 47–64.

Patterson, G. R., Reid, J. B., & Dishion, T. (1992). *Antisocial boys: A social interactional approach* (Vol. 4). Eugene, OR: Castalia.

Paulson, S. E., Marchant, G. J., & Rothlisberg, B. A. (1998). Early adolescents' perceptions of patterns of parenting, teaching, and school atmosphere: Implications for achievement. *Journal of Early Adolescence, 18,* 5–26.

Perkins, D. F., Borden, L. M., Keith, J. G., Hoppe-Rooney, T., & Villarruel, F. A. (2003). Community youth development: A partnership for creating a positive world. In F. A. Villarruel, D. F. Perkins, L. M. Borden, & J. G. Keith (Eds.), *Community youth development: Practice, policy, and research* (pp. 1–23). Thousand Oaks, CA: Sage.

Perkins, D. F., Borden, L. M., & Villarruel, F. A. (2001). Community youth development: A partnership for change. *School Community Journal, 11,* 39–56.

Peterson, C. (2004). Positive social science. *Annals of the American Academy of Political and Social Science, 591,* 186–201.

Pettit, G. S., Bates, J. E., & Dodge, K. A. (1997). Supportive parenting, ecological context, and children's adjustment: A 7-year longitudinal study. *Child Development, 68,* 908–923.

Pittman, K. J., & Fleming, W. P. (1991). *A new vision: Promoting youth development* (Testimony of Karen J. Pittman before the House Select Committee on Children, Youth, and Families). Washington, DC: Center for Youth Development and Policy Research.

Pittman, K. J., Irby, M., & Ferber, T. (2000). Unfinished business: Further reflections on a decade of promoting youth development. In Public/Private Ventures (Ed.), *Youth development: Issues, challenges and directions* (pp. 17–64). Philadelphia: Public/Private Ventures.

Pittman, K. J., Irby, M., & Ferber, T. (2001). Unfinished business: Further reflections on a decade of promoting youth development. In P. L. Benson & K. Pittman (Eds.), *Trends in youth development: Visions, realities and challenges* (pp. 3–50). Boston: Kluwer Academic.

Pittman, K. J., Irby, M., Tolman, J., Yohalem, N., & Ferber, T. (2001). *Preventing problems, promoting development, encouraging engagement: Competing priorities or inseparable goals?* Retrieved on August 31, 2005, from www.forumforyouthinvestment.org.

Public/Private Ventures. (2000). *Youth development: Issues, challenges and directions.* Philadelphia: Public/Private Ventures.

Quinn, J. (1999). Where need meets opportunity: Youth development programs for early teens. *Future of Children, 9*(2), 96–116.

Resnick, M. D., Bearman, P. S., Blum, R. W., Bauman, K. E., Harris, K. M., & Jones, J. (1997). Protecting adolescents from harm: Findings from the National Longitudinal Study on Adolescent Health. *Journal of the American Medical Association, 278*(10), 823–832.

Rhodes, J. E., Grossman, J. B., & Resch, N. R. (2000). Agents of change: Pathways through which mentoring relationships influence adolescents' academic adjustment. *Child Development, 71,* 1662–1671.

Rhodes, J. E., & Roffman, J. G. (2003). Nonparental adults as developmental assets in the lives of youth. In R. M. Lerner & P. L. Benson (Eds.), *Developmental assets and asset-building communities: Implications for research, policy, and practice* (pp. 195–212). Boston: Kluwer Academic.

Rodriguez, M. C., & Morrobel, D. (2004). A review of Latino youth development research and a call for an asset orientation. *Hispanic Journal of Behavioral Science, 26*(2), 107–127.

Roehlkepartain, E. C., Benson, P. L., & Sesma, A. (2003). *Signs of progress in putting children first: Developmental assets among youth in St. Louis Park, 1997–2001.* Minneapolis, MN: Search Institute.

Rogoff, B. (1990). *Apprenticeship in thinking: Cognitive development in social context.* New York: Oxford University Press.

Roth, J., & Brooks-Gunn, J. (2000). What do adolescents need for healthy development: Implications for youth policy. *Social Policy Report, 14*(1), 3–19.

Roth, J., & Brooks-Gunn, J. (2003). What exactly is a youth development program? Answers from research and practice. *Applied Developmental Science, 7*(2), 94–111.

Roth, J., Brooks-Gunn, J., Murray, L., & Foster, W. (1998). Promoting healthy adolescents: Synthesis of youth development program evaluations. *Journal of Research on Adolescence, 8*(4), 423–459.

Rowe, D. C., Vazsonyi, A. T., & Flannery, D. J. (1994). No more than skin deep: Ethnic and racial similarity in developmental process. *Psychological Review, 101*(3), 396–413.

Rutter, M. (1987). Psychosocial resilience and protective mechanisms. *American Journal of Orthopsychiatry, 57*(3), 316–331.

Ryff, C. D., & Singer, B. (1998). The contours of positive human health. *Psychological Inquiry, 9,* 1–28.

Sampson, R. J. (2001). How do communities undergird or undermine human development? Relevant contexts and social mechanisms. In A. Booth & A. C. Crouter (Eds.), *Does it take a village? Community effects on children, adolescents, and families* (p. 3). Mahwah, NJ: Erlbaum.

Sampson, R. J., Morenoff, J., & Earls, F. (1999). Beyond social capital: Spatial dynamics of collective efficacy for children. *American Sociological Review, 64,* 633–660.

Sampson, R. J., Raudenbush, S. W., & Earls, F. C. (1997). Neighborhoods and violent crime: A multilevel study of collective efficacy. *Science, 277,* 918–924.

Sanders, M. G. (1998). The effects of school, family, and community support on the academic achievement of African American adolescents. *Urban Education, 33,* 385–409.

Scales, P. C. (1991). *A portrait of young adolescents in the 1990s: Implications for promoting healthy growth and development.* Minneapolis, MN: Search Institute.

Scales, P. C. (2001). The public image of adolescents. *Social Science and Modern Society, 38*(4), 64–70.

Scales, P. C. (2003). *Other people's kids: Social expectations and American adults' involvement with children and adolescents.* New York: Kluwer Academic/Plenum Press.

Scales, P. C., & Benson, P. L. (2004). Prosocial orientation and community service. In K. A. Moore & L. Lippman (Eds.), *What do children need to flourish* (pp. 339–356). New York: Kluwer Academic/Plenum Press.

Scales, P. C., Benson, P. L., Leffert, N., & Blyth, D. A. (2000). Contribution of developmental assets to the prediction of thriving among adolescents. *Applied Developmental Science, 4*(1), 27–46.

Scales, P. C., Benson, P. L., & Mannes, M. (2002). *Grading grown-ups 2002: How do American kids and adults relate?* Minneapolis, MN: Search Institute.

Scales, P. C., Benson, P. L., Roehlkepartain, E. C., Hintz, N. R., Sullivan, T. K., Mannes, M., et al. (2001). The role of neighborhood and community in building developmental assets for children and youth: A national study of social norms among American adults. *Journal of Community Psychology, 29*(6), 703–727.

Scales, P. C., Benson, P. L., Roehlkepartain, E. C., Sesma, A., Jr., & van Dulmen, M. (in press). The role of developmental assets in predicting academic achievement: A longitudinal study. *Journal of Adolescence.*

Scales, P. C., Blyth, D. A., Berkas, T. H., & Kielsmeier, J. C. (2000). The effects of service-learning on middle school students' social responsibility and academic success. *Journal of Early Adolescence, 20*(3), 332–359.

Scales, P. C., & Leffert, N. (1999). *Developmental assets: A synthesis of the scientific research on adolescent development.* Minneapolis, MN: Search Institute.

Scales, P. C., & Leffert, N. (2004). *Developmental assets: A synthesis of the scientific research on adolescent development* (2nd ed.). Minneapolis, MN: Search Institute.

Scales, P. C., Leffert, N., & Vraa, R. (2003). The relation of community developmental attentiveness to adolescent health. *American Journal of Health Behavior, 27*(Suppl. 1), S22–S34.

Scales, P. C., & Roehlkepartain, E. C. (2003). Boosting student achievement: New research on the power of developmental assets. *Search Institute Insights and Evidence, 1*(1), 1–10.

Scales, P. C., & Roehlkepartain, E. C. (2004). Service to others: A "gateway" asset for school success and healthy development. In National Youth Leadership Council (Eds.), *Growing to greatness: The state of service-learning report* (pp. 26–32). Saint Paul: National Youth Leadership Council.

Scales, P. C., Sesma, A., & Bolstrom, B. (2004). *Coming into their own: How developmental assets promote positive growth in middle childhood.* Minneapolis, MN: Search Institute.

Schaeffer, C. M., Petras, H., Ialongo, N., Poduska, J., & Kellam, S. (2003). Modeling growth in boys' aggressive behavior across elementary school: Links to later criminal involvement, conduct disorder, and antisocial personality disorder. *Developmental Psychology, 39,* 1020–1035.

Schaie, K. W. (1965). A general model for the study of developmental problems. *Psychological Bulletin, 64,* 92–107.

Schneirla, T. C. (1957). The concept of development in comparative psychology. In D. B. Harris (Ed.), *The concept of development: An issue in the study of human behavior* (pp. 78–108). Minneapolis: University of Minnesota Press.

Schneirla, T. C. (1959). An evolutionary and developmental theory of biphasic processes underlying approach and withdrawal. In M. R. Jones (Ed.), *Nebraska Symposium on Motivation* (pp. 1–42). Lincoln: University of Nebraska Press.

Seligman, M. E. P., & Csikszentmihalyi, M. (2000). Positive psychology: An introduction. *American Psychologist, 55*(1), 5–14.

Sesma, A., Jr., Mannes, M., & Scales, P. C. (in press). Positive adaptation, resilience, and the developmental assets framework. In S. Goldstein & R. Brooks (Eds.), *Handbook of resilience in children.* New York: Springer.

Sesma, A., & Roehlkepartain, E. C. (2003). Unique strengths, shared strengths: Developmental assets among youth of color. *Search Institute Insights and Evidence, 1*(2), 1–13.

Simpson, A. R., & Roehlkepartain, J. L. (2003). Asset building in parenting practices and family life. In R. M. Lerner & P. L. Benson (Eds.), *Developmental assets and asset-building communities: Implications for research, policy, and practice* (pp. 157–193). New York: Kluwer Academic/Plenum Press.

Skinner, B. F. (1938). *The behavior of organisms.* New York: Appleton.

Small, S., & Memmo, M. (2004). Contemporary models of youth development and problem prevention: Toward an integration of terms, concepts, and models. *Family Relations, 53,* 3–11.

Spencer, M. B. (1995). Old issues and new theorizing about African American youth: A phenomenological variant of ecological systems theory. In R. L. Taylor (Ed.), *Black youth: Perspectives on their status in the United States* (pp. 37–69). Westport, CT: Praeger.

Spencer, M. B. (1999). Social and cultural influences on school adjustment: The application of an identity-focused cultural ecological perspective. *Educational Psychologist, 34,* 43–57.

Spencer, M. B. (2001). Research on African-American adolescents. In J. V. Lerner & R. M. Lerner (Eds.), *Adolescence in America: An encyclopedia* (pp. 30–32). Santa Barbara, CA: ABC-CLIO.

Spencer, M. B., Dupree, D., & Hartmann, T. (1997). A Phenomenological Variant of Ecological Systems Theory (PVEST): A self-organization perspective in context. *Development and Psychopathology, 9,* 817–833.

Spilka, G. (2004). On community-based evaluations: Two trends. *Evaluation Exchange, 9*(4), 6. (Harvard Family Research Project)

Sroufe, L. A. (1979). The coherence of individual development: Early care, attachment, and subsequent developmental issues. *American Psychologist, 34,* 834–841.

Steinberg, L., & Lerner, R. M. (2004). The scientific study of adolescence: A brief history. *Journal of Early Adolescence, 24*(1), 45–54.

Takanishi, R. (1993). An agenda for the integration of research and policy during early adolescence. In R. M. Lerner (Ed.), *Early adolescence: Perspectives on research, policy, and intervention* (pp. 457–469). Hillsdale, NJ: Erlbaum.

Taylor, C. S., Lerner, R. M., von Eye, A., Bobek, D. L., Balsano, A. B., Dowling, E., et al. (2002). Stability of attributes of positive functioning and of developmental assets among African American adolescent gang members and community-based organization members. *New Directions for Youth Development, 95,* 35–55.

Taylor, C. S., Lerner, R. M., von Eye, A., Bobek, D. L., Balsano, A. B., Dowling, E., et al. (2003). Positive individual and social behavior among gang and non-gang African American male adolescents. *Journal of Adolescent Research, 18,* 496–522.

Thelen, E., & Smith, L. B. (1998). Dynamic systems theories. In W. Damon (Series Ed.) & R. M. Lerner (Vol. Ed.), *Handbook on child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 563–634). New York: Wiley.

Theokas, C., Almerigi, J., Lerner, R. M., Dowling, E. M., Benson, P. L., Scales, P. C., et al. (2004). Conceptualizing and modeling individual and ecological asset components of thriving in early adolescence. *Journal of Early Adolescence.*

Thomas, A., & Chess, S. (1977). *Temperament and development.* New York: Brunner/Mazel.

Tierney, P., Grossman, J. B., & Resch, N. L. (1995). *Making a difference: An impact study of Big Brothers/Big Sisters.* Philadelphia: Public/Private Ventures.

Tolan, P. H., Gorman-Smith, D., & Henry, D. B. (2003). The developmental ecology of urban males' youth violence. *Developmental Psychology, 39,* 274–291.

Tolman, J., & Pittman, K. (2001). *Youth acts, community impacts: Stories of youth engagement with real results.* Tahoma Park, MD: The Forum for Youth Investment.

U.S. Department of Health and Human Services. (1999). *Trends in the well-being of America's children and youth.* Washington, DC: U.S. Government Printing Office.

U.S. Department of Health and Human Services Administration for Children and Families. (1996). *Reconnecting youth and community: A youth development approach.* Washington, DC: U.S. Government Printing Office.

Udry, J. R., Li, R. M., & Hendrickson-Smith, J. (2003). Health and behavior risks of adolescents with mixed-race identity. *American Journal of Public Health, 93,* 1865–1870.

Villarruel, F. A., Perkins, D. F., Borden, L. M., & Keith, J. G. (2003). *Community youth development: Practice, policy, and research.* Thousand Oaks, CA: Sage.

Vygotsky, L. S. (1978). *Mind in society: The development of higher educational processes* (M. Cole, V. John-Steiner, S. Scribner, & E. Souberman, Eds.). Cambridge, MA: Harvard University Press.

Wandersman, A., & Florin, P. (2003). Community interventions and effective prevention. *American Psychologist, 58,* 441–448.

Wang, M. C., Hartel, G. D., & Walberg, H. J. (1990). What influences learning? A content analysis of review literature. *Journal of Educational Research, 84,* 30–43.

Way, N., & Robinson, M. G. (2003). A longitudinal study of the effects of family, friends, and school experiences on the psychological adjustment of ethnic minority, low-SES adolescents. *Journal of Adolescent Research, 18*(4), 324–346.

Weissberg, R. P., Kumpfer, K. L., & Seligman, M. E. P. (2003). Prevention that works for children and youth. *American Psychologist, 58,* 425–432.

Werner, E. E., & Smith, R. S. (1989). *Vulnerable but invincible: A Longitudinal Study of Resilient Children and Youth.* New York: Adams, Bannister and Cox.

West, D. D. (1974, December). Youth development: A new look at an old concept. *Youth Reporter,* 5–8.

Whitlock, J. L. (2003). *Voice, visibility, place, and power: Correlates of school and community connectedness among eighth, tenth and twelfth grade youth.* Unpublished doctoral dissertation, Cornell University.

Whitlock, J. L., & Hamilton, S. F. (2003). The role of youth surveys in community youth development initiatives. *Applied Developmental Science, 7*(1), 39–51.

W. K. Kellogg Foundation. (n.d.). *Kellogg Youth Initiative Partnerships 1978–1997: Lessons learned from the crucial first decade of positive youth development through community-based programming.* Battle Creek, MI: Author. Retrieved September 22, 2004, from http://www.wkkf.org/Pubs/YouthEd/KYIP/Pub3174.pdf.

W. T. Grant Foundation. (1988). *The forgotten half: Pathways to success for America's youth and young families.* New York: W. T. Grant Foundation.

Wynn, J. (1997). *Primary supports, schools, and other sectors: Implications for learning and civic life.* Paper presented at the Harvard Project on Schooling and Children. Chicago, IL: Chapin Hall Center for Children.

Yates, M., & Youniss, J. (1996). A developmental perspective on community service in adolescence. *Social Development, 5,* 85–111.

Youniss, J., McLellan, J., & Yates, M. (1997). What we know about engendering civic identity. *American Behavioral Scientist, 40,* 620–631.

Zaff, J., & Michelsen, E. (2002). *Encouraging civic engagement: How teens are (or are not) becoming responsible citizens.* Washington, DC: Child Trends.

Zaff, J. F., Moore, K. A., Papillo, A. R., & Williams, S. (2003). Implications of extracurricular activity participation during adolescence on positive outcomes. *Journal of Adolescent Research, 18,* 599–630.

Zeldin, S. (1995). Community-university collaborations for youth development: From theory to practice. *Journal of Adolescent Research, 10*(4), 449–469.

Zeldin, S. (2000). Integrating research and practice to understand and strengthen communities for adolescent development: An introduction to the special issue and current issues. *Applied Developmental Science, 4*(Suppl. 1), 2–10.

Zeldin, S. (2002). Sense of community and positive adult beliefs toward adolescents and youth policy in urban neighborhoods and small cities. *Journal of Youth and Adolescence, 31*(5), 331–342.

Zeldin, S. (2004). Youth as agents of adult and community development: Mapping the processes and outcomes of youth engaged in organizational governance. *Applied Developmental Science, 8*(2), 75–90.

Zeldin, S., Kimball, M., & Price, L. (1995). *What are the day-to-day experiences that promote youth development? An annotated bibliography of research on adolescents and their families.* Washington, DC: Academy for Educational Development, Center for Youth Development and Policy Research.

Zweig, J. M., Phillips, S. D., & Lindberg, L. D. (2002). Predicting adolescent profiles of risk: Looking beyond demographics. *Journal of Adolescent Health, 31*(4), 343–353.

CHAPTER 17

Religious and Spiritual Development throughout the Life Span

FRITZ K. OSER, W. GEORGE SCARLETT, and ANTON BUCHER

A DEVELOPMENTAL APPROACH 943
IS RELIGIOUS AND SPIRITUAL DEVELOPMENT RESISTANT TO THE POSTMODERN PATH? 944
A HISTORICAL PERSPECTIVE 946
Religious and Spiritual Development as Maturing 947
Religious and Spiritual Development as Coping: Psychoanalytic Theory 948
Religious and Spiritual Development as Perfecting 951
DEFINING RELIGIOUS AND SPIRITUAL DEVELOPMENT 952
Religion, Religiousness, and Spirituality 953
Content, Form, and Function 954
Stage and Structure 956
STAGE-STRUCTURAL THEORIES 957
Cognitive-Stage Theories: Ronald Goldman 958
Faith Developmental Theory: James Fowler 959
Stages of Religious Judgment and Reasoning: Fritz Oser and Paul Gmünder 961
The Relational and Contextual Model of Development: Helmut Reich 965
STAGE-STRUCTURAL THEORIES: CONCERNS 965
ALTERNATIVES TO STAGE-STRUCTURAL THEORIES 967
Susan Kwilecki's Substantive-Functional Approach 967
The Spiritual Child Movement 968
Cognitive-Cultural Theories 970
Developmental Systems Theories 971
CONCEPTUAL DEVELOPMENT IN RELIGIOUS AND SPIRITUAL DEVELOPMENT 972
Studies Carried Out from a Stage-Structural Approach 972
Studies Carried Out from a Cognitive-Cultural Approach 975
A Synthesis 976
RELIGIOUS AND SPIRITUAL DEVELOPMENT IN CONTEXT 976
The Family Context 977
Religious Schools and Religious Education 980
Congregations 981
POSITIVE CORRELATES OF RELIGIOUS AND SPIRITUAL DEVELOPMENT 982
Health and Well-Being 982
Moral Development 983
Coping 984
Positive Correlates in Advanced Age 985
NEGATIVE CORRELATES AND PATHOLOGY 985
Cults, Occultist Practices, and Terrorist Groups 987
Mental Disorders 989
Pathogenic (Toxic) Religious Beliefs, Practices and Attitudes 989
CONCLUSIONS 990
REFERENCES 991

A young man meets his former professor and relates that he has recently fallen in love. He says he believes his falling in love is a matter of destiny, a gift given by chance. The older man listens intently and then suggests this experience cannot have happened by chance, that it is indeed a gift, a gift given by the two people involved *and* by God. He also suggests that a development such as this always has a hidden, transcendent meaning.

In this sketch of a conversation, we are confronted with judgments about the meaning of an important life event—falling in love. One judgment seems to have no connection to religion or spirituality, while the other seems to be very much connected to religion. It is judgments such as these that theories of religious development must explain, and in such a way that we understand individual change, transformations, pro-

The authors would like to thank Kathryn Tabone, Mitchael Steorts, and Alexis Gerber for their help in preparing the manuscript.

Preparation of this chapter was supported by a grant from the Templeton Foundation.

gression, and regression as well as commonalities across persons, groups, and ages.

Thirty years ago, theories of religious development avoided explaining issues expressed in our scene—issues about faith and transcendence. Rather, theories of religious development applied a cognitive, Piagetian approach to concepts and knowledge—for example, in explaining how children understand the concept of God (Goldman, 1964).

Religious thinking was seen as an application of general cognitive structures, such that lower levels of religious thinking were taken as expressions of immature, magical, and egocentric thinking. In doing so, researchers on religious and spiritual development gave no value to lower stage constructions of meaning. They saw nothing in the way lower stages can provide for a growing religious and spiritual rationality. In this chapter, we explore theories providing explanations of religious and spiritual development quite different from that provided by Piagetian stage theory.

Here is another story to help define our area of inquiry: On arrival at a birthday party, a young woman notices candles in front of every invited guest. After a while, the host asks everyone present to concentrate on the candles, to become quiet, to close their eyes and then to share a good wish for the birthday person. The room is silent, and then, when wishes are shared, every word is valued. What happens here is a form of going into as well as beyond oneself—which is what many take to be something spiritual.

As with religious development, spiritual development is also related to change and transformation, to progression and regression. However, if separated from religious development, the contents of spiritual development seem less fixed, and the steps toward higher, more complex levels seem less evident. There is today no theory of pure spiritual development. That is why in this chapter, we explore alternative theories of spiritual growth, and why we use *religious* and *spiritual* as highly overlapping entities, which can be taken mostly together.

We believe that religious and spiritual development is a normative task. As such, developing religiously and/or spiritually is important because it transforms narrow-minded religious behavior and thinking into open, fully integrated religiosity and spirituality, thus avoiding central problems, including religious fundamentalism, intolerance, and war. However, being mindful of the challenges faced by any normative approach, we emphasize especially the challenge presented by alternative conceptions of endpoints of development—including the alternative of no definite endpoint.

Thus, this chapter aims to examine the emergence and growth of religious *and* spiritual development from a variety of perspectives, but with a special emphasis on those with a transformative view. It does so using two overarching paradigms or frameworks. The first is the organismic or cognitive—structural paradigm associated with the stage theories of Piaget, Werner, and Kohlberg. The second is the developmental systems paradigm that has gained interest over the past 2 decades (Lerner, 2002). In one sense, the developmental systems paradigm includes the organismic paradigm such that they operate on different conceptual levels. In theory the two are compatible, and we use them in this way, as theoretically compatible. However, in practice, those adopting a developmental systems paradigm have often settled on simple definitions of religious and spiritual development. The strength and contribution of the organismic paradigm is that it forces attention on the problem of definition. This is a major reason for introducing the concept of stage. We use the organismic paradigm to better define religious and spiritual development—and later on, use mostly a developmental systems paradigm to discuss the literature on *contexts, situatedness influences, supports, outcomes,* and *effects.*

The chapter examines the following major questions in particular:

- How should we define religious and spiritual development?
- What is universal and what is culturally situated with respect to religious and spiritual development?
- What triggers, causes, and supports religious and spiritual development?
- What evidence is there for religious and spiritual development promoting character development, avoiding risky behavior, and fostering thriving in general?
- What evidence do we have for religious and spiritual development promoting physically and psychologically unhealthy behavior?

A DEVELOPMENTAL APPROACH

To explain religious and spiritual development requires explaining the antecedents and consequences of religious

and spiritual content and belief, religious and spiritual practical life, and religious and spiritual structure (Baltes, Lindenberger, & Staudinger, 1998). It also requires explaining how an existential experience can be interpreted differently at different times in life and with different complexity, styles, and meaning-making capacities. Finally, it means explaining how religious and spiritual development elucidates growth and change in ways of being in the world that need not contradict the general enlightening process of modern and postmodern society. Our approach is individual centered in that religious and spiritual behavior is seen as rooted in the person who is immersed in and influenced by life events, learning, and culture.

The question of how apparently simple levels of development are transformed into complex forms is central (Case, 1985; Fischer & Bidell, 1997; Fischer & Rose, 1999; Pascual-Leone, 1983). We adhere to the discontinuous approach to development, but, in so doing, we differentiate highly according to lifestyles, denominations, cultures, situations, intelligence, and ethnographic experiences. We offer no stereotypic portraits of stages. Rather, we describe and explain how individuals in modern societies transform their religious attitudes, judgments, and feelings in the life span. Development is the focus—so much so that general discussions about the psychology and sociology of religion (Brown, 1987; Durkheim, 1915/1995; Grom, 1992; Hood, Spilka, Hunsberger, & Gorsuch, 1996; Wulff, 1991) are avoided.

Taking a developmental approach to religiousness and spirituality has serious implications for designing interventions to help. When religiousness and spirituality make life uncontrollable and bound to blind faith, they can easily become sources for inhuman behavior, intolerance, and painful dependency on dysfunctional groups. But when real development occurs, religiousness and spirituality can be compared to any other developmental transformation producing losses and gains in a flexible and complex human personality.

Thus, religious and spiritual development contains the growth of the personality and identity in the broadest sense. Religious and spiritual knowledge, feelings, belonging, self-efficacy, and identity—all are part of development and change and must—to the extent that research is available—be part of our overall developmental frame.

In this chapter, we defend the thesis that religious and spiritual thoughts, acts, and feelings can neither be derived from nor reduced to something else. They have their own meaning, roots, and core—like morality, mathematics, and music. Later on, we speak about religiousness as having a fundamental mother structure, which is generated, in part, from the universal experience that life is fragile. Even at early ages, children ask questions about the meaning of death, about arbitrariness and contingency, and about why there is misfortune and evil. This questioning reveals the religious mother structure, and it provides one expression of and impetus for spiritual development.

IS RELIGIOUS AND SPIRITUAL DEVELOPMENT RESISTANT TO THE POSTMODERN PATH?

In 1791, Condorcet (1789/1976), the French Minister of Education, predicted that as the human intellect progressed, religion would be dispensed with in a culture largely dominated by science. In the nineteenth and twentieth centuries, leading thinkers agreed, among them Karl Marx, Sigmund Freud, and James Leuba. Marx dismissed religion as the "opium of the people" because he thought religion alienated people and legitimized the exploitation of the proletariat. Freud regarded religion as an obsessional neurosis, an infantile illusion that humanity would have to overcome by moving in the direction of "God as logos." Leuba, one of the founding fathers of the psychology of religion, considered religiousness to be negatively correlated with rationality, implying that religiousness is something to be overcome.

However, at the beginning of the third millennium, research tells us that Condorcet's prognosis has not been fulfilled. The opposite has happened. The classic secularization thesis, which claims there is a successive weakening of religiousness in the postmodern age, has been refuted. In the United States, 96% of the population professes to believe in God (Gallup, 1995) and 75% of U.S. adolescents say they try to follow the teachings of their religion (P. King & C. Boyatzis, 2004). In most European countries, the numbers are markedly smaller, but even in a country such as France, with its distinct lay history, there are still approximately 67% who believe in God (Denz, 2002, p. 40).

In Europe, in general, we see that persons in the new millennium are less apt to belong to a denomination but still feel themselves to be religious and/or spiritual.

For example, in a large sociological study in Austria, Zulehner, Hager, and Polak (2001) found that 94% of the people in their sample felt strongly religious despite only 27% saying they are Christians, 30% saying they have a patchwork religiosity, 30% saying they are humanists, 13% saying they are atheists, and only a small number saying they participate in active church life. In addition, the correlation between social engagement and religiosity was very high, a finding consistent with findings from the research of many, which shows that willingness to perform volunteer service is positively associated with stable or upward religious developmental trajectories (Donnelly, Matsuba, Hart, & Atkins, 2005; Youniss, McLellan, Su, & Yates, 1999).

If anything, the postmodern era manifests tendencies to become more religious, not less. New religious movements, often of a fundamentalist nature, are motivating millions. More and more religious groups are succeeding, among them totalitarian sects. And with regard to forms of spirituality, the enormous variety suggests that we are today in the midst of a spirituality "boom."

The evidence for their being a spirituality boom comes from several sources. There are the many new books on spirituality with titles such as *Heart and Home. Embracing the Spiritual in Everyday Life* (Benish, 2001) and *The Way. Using the Wisdom of Kabbalah for Spiritual Transformation and Fulfillment* (Berg, 2001). There are also now psychological journals devoting special issues to spiritual topics, for example, the *Journal of Individual Psychology* (2000, Vol. 3) and the journal, *Applied Developmental Science* (2004, Vol. 8). And even a cursory search on the Internet indicates tremendous interest in spirituality and spiritual development. For example, launching a search for "spiritual development" in databases such as *PsycInfo* will produce more hits than "religious development."

The variety and boom are, no doubt, related to the fact that religious freedom has been established as a constitutional right in the developed world so that religious and spiritual beliefs and affiliations can no longer be imposed or prescribed. Connected with this is the way in which spirituality has been released from the power of religious communities. As a result, many now are developing their own religious ideas and practices. These ideas and practices can be rejected as "religion à la carte," but they can also be seen positively as the result of a patchwork religiousness and spirituality that has emerged under the influence of postmodernism.

Furthermore, in academia we now find a renewed interest in religion and spirituality as well as new theories putting religion and spirituality at the very heart of what it means to be human. We see this renewed interest especially in the psychology of religion, which long ago cast off ties restricting it to church religiousness and, in recent times, turned to discussing diverse forms of spirituality (Argyle, 2000; Beit-Hallahmi & Argyle, 1997; Hood, 1995; Hood et al., 1996; Wulff, 1991). And we see that many scientists want to connect religious life and the natural sciences through speculative reflection (Reich, 2004). As for the new theories, we see them suggesting religious and spiritual development is indispensable to human functioning. For example, today, sociobiologists claim religiousness is determined genetically and that religion was and still is an important factor in evolutionary survival (Burkert, 1996; Daecke & Schnakenberg, 2000; Wilson, 1998). Religion, they argue, offers advantages of selection; sects especially serve as examples—since they achieve selection by strengthening group cohesiveness and because they foster aggression toward threatening entities outside the group.

Thus renowned psychologists of religion (Hood et al., 1996, p. 44) have asked, "Is religion in our genes?" In so doing, they are thinking not about specific religions, which are always marked and shaped in sociocultural ways, but about a basic religious disposition, which according to Oerter (1980, p. 293), is activated when young children become conscious of their temporally restricted existence, an experience that leads to a preoccupation, determined by nature, with religious and metaphysical problems. Spirituality, too, has been seen as humanity's answer to its own finite nature (Socha, 1999).

Modern, scientifically based theories of religion and spirituality have explained religious and spiritual development as a means of satisfying the human need to exercise control, indeed, control over and above the mere immanence of the here-and-now and into the great transcendent realm beyond (Flammer, 1994).

Throughout human evolution, belief in the divine has worked because it has helped humans cope with threatening and difficult situations. In addition, religion has legitimized authority and created security—through oaths, for example, but also through the expectation of reciprocity between sacrifice and reward (Burkert, 1996).

As another example of new theories giving a positive view of religious and spiritual development, Huntington (1998, p. 61) has theorized that every culture is based

on a religion, which, in the nature of a latent disposition, retains its power to grow and spread even after it has been subjected to waves of secularization. Furthermore, cultural anthropologists point out that every culture produces a system of religious symbols, which govern individuals' relations with transcendence and provide the ultimate systems of authority. This means "religion can be viewed as a precondition of culture, or as springing from the same roots as culture" (Ohlig 2002, p. 101).

However, *discontinuity, boom, genetic issues,* and *new developments* are not the only terms to use to explain why Condorcet's prognosis has been proven wrong. Today, there are continuities with the past in the way religiosity and spirituality are experienced. Children and young people continue, as they did in the past, to encounter religious phenomena such as church buildings, saffron robed monks, religious sisters, veiled Islamic schoolgirls, orthodox Jews with yarmulkes and side locks, soccer players making the sign of the cross, and people praying at a funeral. Furthermore, places of spirituality are still represented by monasteries and convents, houses of retreat for spiritual exercises, and remote places for tranquility and prayer. Spirituality also includes traditional ideas—negative ideas having to do with suffering and asceticism but also positive ideas having to do with affirming life, being health conscious, and seeking happiness.

In sum, religion and spirituality are alive and thriving both in traditional ways and in ways not even imagined by Condorcet. Now, more than ever, we need to understand this widespread and varied human phenomenon—especially by understanding its development.

A HISTORICAL PERSPECTIVE

The scientific study of religious development dates back to 1882, the year that G. Stanley Hall, in the context of his "Child Study," investigated children's religious imagination (see Huxel, 2000, 95 f). However, the concept of religious development has a much longer history. The books of the dead in ancient Egypt and Tibet described steps leading to the gods and Nirvana respectively. In the Bible, the Apostle Paul noted children's qualitatively different ways of being in the world when he wrote, "When I was a child, I spoke as a child, I understood as a child, I thought as a child; when I became an adult, I put away childish ways" (1 Corinthians 13:11, New Revised Standard Version).

In the Christian faith tradition, the concepts of development and stage have been used frequently to define the religious and spiritual life—so frequently that one might suspect that current stage developmental theory is rooted in the mind-set of this Western tradition. There are many examples. Ambrosias, one of the early church fathers (dec. 379), described four stages in the ascent to God, and Benedict of Nursia (dec. 547) described normatively 12 stages of humility.

Mysticism has also played a central role in developing the concept of religious and spiritual development, and, in recent times, some of the more famous stage models of mystics have been compared to stage models of modern theorists. Thus, M. J. Meadow (1992) showed impressive parallels between Teresa of Avila's seven stages leading to mystical union and Jane Loevinger's model of ego development. Steele (1994) reconstructed John of the Cross's stages of spiritual development in the light of transpersonal psychology, and Oser (2002) compared the steps of the mystical path in both Meister Eckhart and Margerethe Porete to the stages of religious judgment as presented by Oser and Gmünder (1991).

These prescientific descriptions of stages provide no systematic theory or description of age changes. Rather, they define an ideal for the *total* religious life. Nevertheless, they show that, early on, religious leaders made frequent use of the metaphors of stage and step to give their own developmental accounts.

The phenomenon of religious development was also obvious to Jean-Jacques Rousseau (1712–1768). In *Emile* (1762/1979), his novel on education, Rousseau observed younger children's propensity to imagine God as a person as well as their not understanding the abstract language of catechism. From these observations, Rousseau advised that children be kept from religious instruction until they reach adolescence. Centuries later, Ronald Goldman would give similar advice but from a Piagetian theoretical perspective.

In the field of religious education, classical writers such as Salzmann, Basedow, Jean Paul, and Jean Calvin were finely attuned to children's religious development (Schweitzer, 1992). For example, Jean Calvin (1834, p. 200) assigned the Old Testament to children and the New Testament to adolescents, a practice that anticipated G. Stanley Hall's advice at the turn of the twentieth century (Hall, 1900, 1908). Calvin assumed that the vivid stories of the Old Testament matched the interests and mental capacities of children just as the ab-

stract messages of the New Testament did the same for adolescents.

By the turn of the twentieth century, when psychological exploration of religious development began in earnest, the three main paradigms for explaining religious and spiritual development had already been well established as:

1. Religious and spiritual development as maturing
2. Religious and spiritual development as coping
3. Religious and spiritual development as perfecting

In the first paradigm, maturity, loosely defined, is the telos toward which religious and spiritual development tends. Maturity is a value-laden concept, but the values made explicit in this paradigm are attainable by most. In this paradigm, to mature religiously and spiritually is not to become a saint. Rather, it is to become an adult in whatever ways being an adult is culturally defined.

In the second paradigm, maturity is also a telos, but the emphasis is more on the primitive and immature—so that maturity means coping with personal limitations. Here, we see a functional approach—with religious and spiritual development functioning to help us cope. We also see *health* and *maturity* being used almost interchangeably. Nowhere is this paradigm used more extensively than in psychoanalytic theory—so we concentrate on psychoanalytic theory when discussing this paradigm.

The third paradigm explicitly embraces perfection as the goal of development. The telos here is entirely conceptual—though occasionally the talk is of religious or spiritual exemplars. But even in the exemplars, the assumption of this paradigm is not that the exemplar is perfect but that the exemplar points to what perfection consists of, to the standard or ideal that defines development, and allows us to evaluate and explain levels or stages of development as approximations to perfection.

These three paradigms are used to organize the remainder of this section.

Religious and Spiritual Development as Maturing

Research into religious development reached its first highpoint in the beginning decades of the twentieth century, partly as a result of the work of American pioneers in the psychology of religion, in particular, Hall, Leuba, and Starbuck (see Huxel, 2000; Wulff, 1991, pp. 41–53). This era also produced extensive work in Germany, by practical theologians hoping that knowledge derived from the psychology of religion would optimize religious instruction.

These early researchers and practical theologians investigated children's concepts of heaven (Barth, 1911), God (Nobiling, 1929), religious doubt (Wunderle, 1932), and religious ideas in general (Voss, 1926). Their central focus was on describing age differences rather than on constructing theories. For most of these early investigators, religious development was a maturational process (Gesell, 1977; Kroh, 1965). Nowhere do we see this more clearly than in the stage theory of G. Stanley Hall.

G. Stanley Hall

Hall (1904, 1923) argued that individual religious development recapitulates the religious development of the species. So, religious development begins with unconsciousness and is followed by a stage of fetishism and nature worship—the very features that define both ancient idolatrous religions and the religious concepts of school children with their concrete and anthropomorphic images of God.

Hall also argued that children need to work through these earlier (i.e., historically earlier) ways of being religious before they can adopt more advanced, recently acquired ways. So, as mentioned previously, he suggested that the religious education of children should focus on the Old Testament with its concrete images and stories, and later on, during adolescence, on the New Testament with its abstract principles and values.

Hall's influence and contribution was also in his promoting careful, empirical work as well as in his explaining that adolescence is a significant time for spiritual transformation.

Hall's linking individual and phylogenetic religious development has been critiqued and refuted (Gould, 2003a). However, his influence on the psychology of religious development has been enormous, not only because he got others to think developmentally, but also because he demonstrated that religious development is a domain that should be studied scientifically. Hall's phylogenetic theory was a maturationist theory in that it assumed religious development unfolded in ways heavily influenced by biology. This maturationist understanding and emphasis continued long after Hall—even into the second half of the twentieth century.

Gordon W. Allport

The third example of religious and spiritual development as a process of maturing is the work of

G. W. Allport. In *The Individual and His Religion* (Allport, 1950), Allport described two types of religiousness, which form a developmental sequence. The first type is the "self-interested" religiousness of younger children who see prayers as a means of getting material things. Children also imagine God in a concrete, anthropomorphic manner. Thus, we have the precursor of the well-established concept, "extrinsic religiousness."

In the years preceding puberty, children's egocentric religiousness leads to disappointment (e.g., initiated by denial of material goods, experiences of theodicy). Subsequently, children form new and more abstract religious concepts and shape a mature and self-disinterested type of religiousness. In the best case, religion becomes part of an adolescent's own personality and fulfils the criterion of functional autonomy: religiousness becomes "intrinsic religiousness."

In the following decades, the distinction between extrinsic and intrinsic religiousness became one of the most powerful distinctions in the psychology of religion. Hundreds of studies showed that intrinsic religiousness is positively correlated with a variety of desirable outcomes, such as a sense of well-being, whereas extrinsic religiousness is positively correlated with undesirable outcomes such as being prejudiced (see the overview by Wulff, 1991, pp. 217–242; see also Hood et al., 1996).

In discussing earlier works using this first paradigm, we see how religious and spiritual maturity can represent an achievable and worthwhile end. Furthermore, we see how maturity has to do with individuals functioning well in their cultures and contributing to their societies. These early works using this first paradigm can be seen as the forerunners of present-day research on religious maturity (Benson, Donahue, & Erickson, 1993). Furthermore, they can be seen as the forerunners of present-day research on resilience and positive youth development as they relate to religious and spiritual development (Lerner, Dowling, & Anderson, 2003). Later on, we have more to say about present-day research continuing in this tradition of thinking about religious and spiritual development as a maturing process.

Religious and Spiritual Development as Coping: Psychoanalytic Theory

Psychoanalytic theory is—if developmental—essentially a theory of motivation. More precisely, it is a collection of related theories connected by their sharing a common focus on unconscious, intrapsychic conflicts. Psychoanalytic theory has played a central role in defining religious and spiritual development and its functions. It has done so in both controversial and contradictory ways—with theorists from the same psychoanalytic community often reaching opposite conclusions based on common starting points. Nowhere do we see this more clearly than in the competing theories of Freud and Jung and in the radically different ways that Freudian, ego analytic, and object relations theorists have evaluated religion and religious development.

Sigmund Freud

Sigmund Freud took issue repeatedly and in an influential way with religiousness. In so doing, he stimulated thousands of psychoanalytic studies of religion (Beit-Hallahmi, 1996a; see also Shafranske, 1995; Wulff, 1991, pp. 253–316). As early as 1907, he characterized religiousness as an obsessional neurosis. For Freud, religious concepts are illusions that provide comfort and security to those threatened by the forces of nature, the inevitability of old age and death, and the hostility of others. Their origins can be traced to protective persons with whom the child has close contact in early childhood.

The most important protective person was, for Freud, the father, toward whom boys have hostile feelings during the Oedipal phase, resulting in the father image being projected into the transcendent realm. In his later writings, Freud put his theory of the psychic origins of God as follows: "To begin with, we know that God is a father-substitute; or, more correctly, that he is a copy of a father as he is seen and experienced in childhood—by individuals in their own childhood . . ." (Freud, 1923a, p. 85).

However, in classic Freudian psychoanalysis, religious development is not merely a matter of projection but also of sublimating sexual libido. In an early paper titled, "Obsessive Actions and Religious Practices," Freud (1907) claimed that religiousness arose as a "renunciation of certain impulses . . . within which . . . a sexual element cannot normally be excluded." Freud's student, Schroedter (1908), drew from this the general conclusion that the origin of religiousness, in particular, emotive and mystical forms of religiousness, resides in the repression of erotic instincts. What is repressed, he argued, reappears in a distorted form, as in acts of piety that border on hysteria.

Pfister (1911), one of the first theologians familiar with Freudian theory, used Freudian theory to explain the religious development of Margarethe Ebner, a mystic of the high Middle Ages. Ebner had the habit of lying next to a crucifix and experiencing the "sweetest" sensations—for Pfister, evidence of the sublimation of unsatisfied sexuality. Pfister (1925) applied the same kind of analysis to Count Ludwig von Zinzendorf (1700–1760), founder of the Moravian Church. When he was forty, Von Zinzendorf began worshipping the wound in the side of Jesus—evidence, according to Pfister, for the sublimation of homosexual feelings.

The constellation of unresolved Oedipal feelings, homoerotic inclinations, sublimation, repression, and neurosis in general was subsequently interpreted into dozens of biographies of prominent religious personalities (see reviews by Bucher, 2004; Hitschmann, 1947; Zeligs, 1974, on the religious development of biblical figures).

Not surprisingly, the classical Freudian view of religious development drew criticism on a massive scale (see reviews by Beit-Hallahmi, 1996a; Meissner, 1984). For example, Greve and Roos (1996) questioned the universal applicability of the Oedipus complex and argued that the Oedipus story is, after all, a myth, not an accurate representation of a universal phenomenon. Freud's reducing God to an earthly father also came under attack. For example, on the basis of clinical case studies, Schjelderup and Schjelderup (1932) described how people develop their own mother religions, especially in Eastern contexts. However, possibly the most damning criticism of Freud's psychology of religious development has been the criticism that there is no way to disprove Freud's claims because when claims cannot be disproved, they fall outside the domain of science.

Carl Jung

For Carl Gustav Jung, the son of a protestant minister, religion played a positive role in both his theory and personal life. Still in the psychoanalytic tradition, Jung provided a quite different focus than Freud's—with his concept of individuation (1968). The concept of individuation explains individual development as a gradual integration of psychic structures, creating a self where conscious and unconscious are fully integrated and compatible.

As for his theory's connection to religious and spiritual development, Jung spoke about a "personal unconscious" or hidden psychic realm that he referred to as the "shadow." According to Jung, every individual has to cope with what is suppressed, ignored, and neglected in personal life. In doing so, individuals develop toward wholeness, becoming a wholly integrated self. For this process of becoming an integrated self (*individuation)*, religion plays a central role.

The goal of the individual is to balance the demands of reality with personal needs. This balancing is achieved with the help of inherited archetypes in a collective unconscious that is a part of every individual's heritage. Numinous archetypes are structuring principles that are produced through dreams and cannot be produced by mind and reflection. Religions play a central role by effecting this balance in the way they relate to the archetypes. Because religious myths are projections of the archetypes, the messages of the soul and the messages of religions are of similar form and can be translated each to the other. In doing so, individuals cope better by coming to terms with their shadow.

Therefore, whereas for Freud development consists of putting religion behind us, for Jung, development consists of embracing and using religion to support development.

Erik Erikson

Erikson represents a third variation on the psychoanalytic theme with respect to religious and spiritual development. As did Freud and Jung, Erikson focused on unconscious intrapsychic conflicts to explain what fuels development. However, Erikson's emphasis was much more on how intrapsychic conflict reflects not only familial themes but also societal-cultural themes. In many ways, Erikson fits more comfortably into present-day discussions about context, culture, and development.

With respect to Erikson and religious and spiritual development, the two main concepts are "basic trust" and "identity." Developing basic trust was, for Erikson, the central religious issue—not only trust in God but also trust in a universe that offers enough to make life worth living.

However, for Erikson, it is the struggle to achieve a personal identity that warranted special attention. For Erikson, religion offered one of several ways in which individuals achieve identity. Nowhere is this better illustrated than in Erikson's (1958) influential book, *Young Man Luther,* in which he shows how Luther used religion to shape and construct his identity.

In *Young Man Luther,* Erikson demonstrated how religious ideology and religious institutions provide ways for

youth to separate themselves from old identifications with parents to achieve a new identity better suited to weather the storms of adulthood and better suited to render them able to contribute to society. In *Young Man Luther,* Erikson shows how Luther's choice to become a monk, his obsessional behavior as a young monk, and, his becoming a great reformer, all reveal his inner struggle to remain identified with his father and his church while, at the same time, to distance himself to become his own person with his own convictions and purpose in life.

Object Relations Theorists

For the past several decades, neo-analytic psychology has focused more and more on the quality of interpersonal relations and on how interpersonal relations are affected by internalized images of self and significant others. Nowhere do we see this more clearly than in the work of those who identify themselves as object relations theorists. Their central focus is on imagination and illusion-making.

While continuing Freud's practice of calling religious imaginings *illusions,* object relations theorists have given illusion-making a positive spin, which treats imagining as a wedge between impulse and objective reality, a wedge that guards against the dangers of impulses and autistic thinking, on the one hand, and the slings and arrows of misfortune and a stultifying status quo, on the other. In Paul Pruyser's (1991) words:

> Illusion is not hallucination or delusion but can deteriorate into them. Illusion formation is . . . a unique process that derives from the imagination. It need not be captive to the autistic process and cannot be locked into the reality testing procedures described by common sense. (p. 176)

Object relations theorists define imagining as a transitional phenomenon, where the boundaries between subjective and objective become blurred. The partial differentiation between what is inside and outside allows individuals to not only creatively manage but also to creatively transform. Pruyser (1991) provides the example of Martin Luther King Jr. and his "I have a dream" speech to illustrate what is meant by religious imagining being a transitional phenomenon that creatively manages and transforms. He writes:

> That speech straddled both the world of ideas and the world of facts; it introduced a new paradigm after showing the bankruptcy of an older one; it combined Yahwistic wrath with the benevolence of a God-in-Christ. But for all his patent creativity, what reliance King had on the great illusionistic traditions of the Bible, black preaching, and Gandhian nonviolence! Absorption in these traditions had become to him a sacred playing—with one sideways glance at the brutal facts of the realistic world and another keen glance at the ever-present explosive turbulence of the autistic world. (p. 179)

The example of King provides insight into the analytic concept of religious and spiritual maturity and the role of religious-spiritual imagining in realizing maturity. Pruyser implies that King's religious imagining grasped something true, though not something true in the sense of scientific truth. Truth in this context is obviously not about propositions that are either true or false. Presumably, truth in this sense has more to do with living lives that are "true."

What is missing, though, is just how to evaluate a religious illusion as true. We are left wondering if Pruyser means to suggest it is universal truths that are revealed in religious imaginings or simply truths that are specific to particular groups and individuals. The following personal story suggests perhaps it is both. Pruyser (1991) writes,

> I attended a denominational school . . . that stood for much greater Calvinist orthodoxy than did my family. Thus, home and school presented me with two different religious and emotional worlds. The first was mellow, optimistic, and forgiving; the second strict, somber and punitive—both equally taking recourse to scripture. . . . There is nothing like such an upbringing to convince a young boy that religion is what you make it, that all of it is what I now call "illusionistic." Fortunately, home won over school, undoubtedly because of its deeper roots in my childhood practicing of the transitional sphere. The hand of God, much talked about in school, was closer to my mother's tender-and-firm hand than to the threatening and often slapping extremities of my teachers. (p. 180)

In other words, for Pruyser—and for many trained in the object relations tradition—the decisive step in religious and spiritual development is choosing between alternative imaginings. For Pruyser, the truth or value of imagining lies not so much in its structure as in its content, and in the value of its content for supporting healthy psychological development. The gentler, nurturing im-

agery promoted in Pruyser's home life seemed healthier to Pruyser than the more punitive imagery promoted in his school life.

But what exactly should one mean by "healthier," and is healthier to be equated with mature? Pruyser and object relations theory in general are not specific with regard to how the concepts of healthy and religious-spiritual development relate—and perhaps for good reason. Health is not to be reified, turned into a "thing"; rather, it is to be used to assess functioning, and functioning is a matter of fit between person and context.

Object relations theory has also contributed by broadening our understanding of the origins of the God concept. For example, Rizzuto (1979) argued that Freud picked too late a period in dating the beginnings of the representation of God in the Oedipal phase. She located the origin of the representation of God in early childhood. Regardless of whether they are raised in a religious manner, children form a representation of God or sacred figures such as the Buddha. These representations or images may derive from the mother, father, or combinations of significant others. Furthermore, the quality of the relationships depicted in these images depends on the quality of early human relationships. These representations or images provide, at best, protection. Later on, they may be held onto, updated, or discarded—to conform to official doctrines or to contradict them.

In sum, classic and neo-psychoanalytic theory provides a variety of examples of work done in the paradigm of coping. Furthermore, these examples are among the forerunners of present-day studies, which also operate in the paradigm of coping. We will have more to say about present-day studies working in the paradigm of coping, such as the case studies of Susan Kwilecki (1999).

Religious and Spiritual Development as Perfecting

> [I]n contradistinction to the process of mere change (development) is a movement toward perfection, as variously as that idea may be constructed. (Kaplan, 1983a)

In describing religious and spiritual development, the previous two paradigms stay close to tangible reality. Persons develop, and some mature, but development and maturity are not remarkable. In contrast, this third paradigm defines and assesses religious and spiritual development in terms of what is remarkable, so remarkable that one may never actually witness an example of someone who reaches the endpoint, someone who is fully developed.

At first glance, this third paradigm seems to revert back to prescientific days when religious and spiritual development meant climbing toward some state of mystical union. However, the paradigm leads in a quite different direction. It leads in the direction of offering specific criteria for defining and evaluating development and for making explicit the often implicit or hidden values in all developmental models. Later on, there will be extended examples to show how this paradigm works. Here, and for the purpose of providing a historical perspective, we concentrate on a single example, namely, the example of William James and his monumental work, *The Varieties of Religious Experience* (1902).

The *Varieties* is arguably the single most influential book in the psychology of religion. Even after a century since it was written, readers find in it insights that are directly relevant to our times (Taylor, 2002). However, the *Varieties* is not normally thought of as a text on religious and spiritual development. For one thing, there is hardly any mention of children. For another, it gives us religious types, but the types themselves seem ordered more along a horizontal plane than along a vertical, developmental one. This seems especially true of James's two major types: "The Healthy-Minded" or "once-born" and the "Sick Soul" or those who feel themselves in need of being "twice-born."

Nevertheless, a closer reading of the *Varieties* shows James to be very much a developmentalist as defined by the third paradigm. In particular, James saw the sick soul as having a more mature grasp of reality than that seen in the healthy minded—and a greater potential for developing spiritually. He shows this developmental ordering of the two types when he turns from writing about the once-born, healthy-minded to writing about the sick soul in need of being twice-born:

> Let us then resolutely turn our backs on the once-born and their sky-blue optimistic gospel; let us not simply cry out, in spite of all appearances, "Hurrah for the Universe!—God's in his Heaven, all's right with the world." Let us see rather whether pity, pain, and fear, and the sentiment of human helplessness may not open a profounder view and put into our hands a more complicated key to the meaning of the situation. (James, 1902, pp. 135–136)

In short, the sick soul has a better grasp of reality and so is in a better position to develop further.

And what might that development consist of? Later on, James tells us when he discusses saintliness. After a second (spiritual) birth, the previously sick soul is more sensitive to the world's contingencies. This is essential to growth, which shows how James can be seen as a developmentalist in the tradition of the third paradigm.

Saintliness is James's way of providing a telos, an ideal endpoint needed to define, evaluate, and explain religious and spiritual development. He makes this clear by characterizing his picture of saintliness as a composite picture, an ideal type, rather than as a picture of specific individuals. In short, James's saint is a standard of perfection that helps define what it means to develop religiously and spiritually.

James's concept of saintliness is not the everyday concept of a moral exemplar who uses religious language. Rather, James's concept of saintliness is essentially religious or spiritual, not moral. In his words, to be a saint is to have "a feeling of being in a wider life than that of this world's selfish little interests; and a conviction, not merely intellectual, but as it were sensible, of the existence of an Ideal Power" (p. 272). He follows this description with the added comment that the saint has "a sense of the friendly continuity of the ideal power with our own life, and a willing self-surrender to its control" (p. 273). For James, religious and spiritual emotions are central. Morality is a by-product.

In the *Varieties,* the saint is an ideal type defining the endpoint of religious and spiritual development. For James, the experience of being a divided self, a self in need of being saved, a lost or sick soul was instrumental for developing toward saintliness. To develop religiously or spiritually meant that things might get worse, not better—at least for a while. For James, simply becoming mature and coping are not, by themselves, enough to define what can ultimately develop when we speak of religious and spiritual development. For James and anyone else working in this third paradigm, it matters little whether anyone actually reaches sainthood and perfection. What matters is that we can conceive of sainthood and perfection and in so conceiving, we can become better able to define, evaluate, and explain religious and spiritual development.

Just as the work of previous writers working in the other two paradigms forecast current research, so, too, the work of James forecast current research and theory using this third paradigm. In particular, James's ideal type, saintliness, forecasts current stage theories, which also use perfection as a telos, particularly the theories of Fowler (1981) and Oser and Gmünder (1991). Later on, we have more to say about these more current theories operating in the paradigm of religious and spiritual development as perfecting.

From the point of view of today's research, these three paradigms for thinking about religious development operate in all discussions taking identity formation as the main goal of development. As King (2003) states, ". . . identity development that emerges . . . within religion is an identity that transcends the self and can promote a sense of commitment that not only fosters individual well-being but promotes the good of society as well" (p. 197). These three paradigms thus are holistic approaches to religious and spiritual development, a point we return to repeatedly throughout the remainder of the chapter.

DEFINING RELIGIOUS AND SPIRITUAL DEVELOPMENT

In Goethe's (1974) *Faust,* when Gretchen asked Faust about his attitude toward religion, she was thinking of faith in the church, salvation of souls, and fear of hell. Presumably, so was Faust. Were she to ask her question today, she would have to imagine quotation marks around "religion" and do her best to interpret which of several meanings was embedded in Faust's response. Today, one of the central problems in the psychology of religious and spiritual development—as mentioned in the beginning—is the problem of defining religious and spiritual.

This problem of defining is nothing new. Almost a century ago, James Leuba (1912, p. 341) listed 48 different definitions of religion, which led him to conclude that attempts to define *religion* precisely border on megalomania. Since, the situation has become still more difficult because *spirituality* also needs definition and because the religious-spiritual landscape has become more pluralistic. Generally accepted definitions do not exist (Beile, 1998, p. 24), and the search for a common definition can proceed almost indefinitely (Brown, 1987, p. 17). For this reason authoritative textbooks on the psychology of religion generally avoid providing a working or operational definition (Beit-Hallahmi, 1989, p. 11; Beit-Hallahmi & Argyle, 1997, p. 5; Hood et al., 1996, p. 7).

Nevertheless, even though there is no commonly accepted definition, there are commonly accepted distinctions that help define religious and spiritual development. In particular, there are the commonly accepted distinctions between *religion* and *religiousness,* between *religiousness* and *spiritual,* and between *content, form,* and *function.* We discuss each of these distinctions to address the problem of definition. In addition, we discuss the concepts of *structure* and *stage* as indispensable means for defining and explaining the religious and spiritual development of persons and not just of acts, thoughts, and feelings considered separately.

Religion, Religiousness, and Spirituality

Religion refers to institutions and systems consisting of organizational structures, codes of behavior, and symbol systems defining assumptions and beliefs designed to create in people powerful, comprehensive, and enduring world views and attitudes. As such, religion is primarily susceptible to sociological analysis.

Religiousness refers to *subjective* modes of experiencing and interpreting, making religiousness primarily susceptible to psychological analysis. One and the same religion can be reconstructed and experienced in quite different ways leading to quite different types of religiousness. The Catholic Church, for example, can be a source of fastidious anxieties for one person and a secure, maternal home for another. Therefore, it is ultimately the individual who determines religiousness on the basis of his or her subjective experience: "Events or feelings are only 'religious' if a person defines them as such" (Stark, 1965, p. 99). Religiousness refers to much more than religious practice such as attending religious services and joining religious institutions. Many regard themselves as being religious even though they have left or avoided religious institutions and religious practice.

Nor is it any less difficult to arrive at a definition of spirituality. For a good many experts, when it comes to spirituality, the problems of defining are even more difficult (Hood et al., 1996, p. 115). However, there is no way to evade the issue given the fact that at the present time, there is scarcely a discussion of faith and scarcely a book on religion that does not use *spirituality.* Indeed, the term *spirituality* is visibly eclipsing the term *religiousness.* The increased use of spirituality derives to a large extent from the loss of relevance of religious institutions and traditions. Many feel themselves bound by spiritual ideals even as they feel themselves not bound by religious tradition (see story on p. 943).

In order not to exclude these people, Utsch (1998, p. 97) argued in favor of converting spirituality into an autonomous research subject separated from the subject of religion. In his view, such a separation is justified since religion can exist without spirituality when it "consists only of rules of behavior, of theology not related to experience, and of rites which have not been understood" (p, 99). Spirituality is thus named *ex negativo* and defined as a *subjective experience* of what is existentially relevant for human beings.

However, a good many scholars retain the historical connection between religion and spirituality by linking spirituality to the experience of transcendence. For example, Pargament (1997) defined spirituality as "a highly individualized search for the sense of connectedness with a transcendent force" (p. 38). McFadden (1996) also included a religious element in her definition when she designated spirituality as a "motivational-emotional phenomenon associated with a sense of meaningful integration within the self, with other persons and the world, and with the Divine" (p. 387). Miller and Martin (1988) did something similar in saying, "Spirituality entails the acknowledgment of a transcendent being, power, or reality greater than ourselves" (p. 14).

In sum, spirituality can be identical with religiousness by its constituting a relationship to a divine or transcendent power, or it can be independent of religiousness by its stressing a more philosophical orientation. Put another way, spirituality can refer to actions, which rekindle religiousness or to actions without religious reference such as relaxation exercises practiced by self-professed atheists. Religiousness and spirituality are therefore not to be seen as in contrast to each other but rather as overlapping (Reich, Oser, & Scarlett, 1999, see also p. 943).

This view of religiousness and spirituality as being both independent and overlapping has been supported by several recent studies. For example, Dowling et al. (2004) used factor analytic and structural equation modeling to separate out spirituality from religiosity factors contained in the questionnaire results of Search Institute's database. They did so by equating spirituality with self-transcendence evidenced in the way individuals become civic-minded and concerned about contributing to society.

In another study, Zinnbauer et al. (1997) asked a sample of 350 persons whether they understand themselves as:

- Spiritual and religious (74%)
- Spiritual but not religious (19%)
- Religious but not spiritual (4%)
- Neither spiritual nor religious (3%)

From these data, we see that the overwhelming majority understood themselves as being both spiritual *and* religious (74%). Only 19% understood themselves as being exclusively spiritual. Still, despite there being a relatively small percentage that understood themselves to be exclusively spiritual, spiritual development is a potentially powerful resource for positive human development (Benson, Roehlkepartain, & Rude, 2003, p. 205). It is, however, an understudied, complex, and multifaceted concept, one that overlaps with many aspects of religious development, and one that is shaped by both individual capacities and ecological influences—as we discuss later.

It is the relatively small group that considers itself to be spiritual but not religious, which furnishes the popular stereotype that religion is antiquated for being institutional and dogmatic, whereas spirituality is central for being personal and open. The wide-spread acceptance of this stereotype has led Hill (2000) to warn against polarizing religiousness as bad and spirituality as good—because virtually all religions promote spirituality, and virtually all spiritual practices have at one time or another been promoted in religious traditions.

In the social sciences, the effort to distinguish religiousness from spirituality has not been matched by an equal effort to specify what they have in common. Outside the social sciences, there has been more said about this issue. The work of Wilfred Cantwell Smith on faith has been most influential (Smith, 1998a, 1998b).

Smith, the historian and long-time dean of comparative religious studies, has argued that faith is the central category in both religiousness and nonreligious spirituality. As explained by him, faith refers to a person's involvement in the symbols of a faith tradition rather than to the symbols themselves. Faith is more a verb than a noun. It is more about action and living a certain way than it is about something static such as a dogma, belief, or symbol. Smith points out that this meaning of faith is much older than the newer meaning of faith as belief (Smith, 1998a). It was the Enlightenment that spawned the newer meaning and reduced religion to matters of belief or to its alternative, feeling.

The picture Smith (1998a) paints of faith-filled lives emphasizes how individuals, by participating in the symbols of their faith traditions have been transformed:

> To live religiously is not merely to live in the presence of certain symbols, but to be involved with them or through them in a quite special way, a way that may lead far beyond the symbols, that may demand of a person's response, and may affect one's relations not only to them but to everything else: to oneself, to one's neighbor and to the stars. (p. 3)

But the main point here is that faith is about participation and response, not about belief. "One does not believe a symbol. Rather, one responds to it." (Smith, 1998a, p. 146).

The consequences of conflating faith and belief have been to marginalize religion and to dismiss spirituality as something less than rational:

> Belief became . . . the category of thought by which skeptics, reducing others' faith to manageability, translated that faith into mundane terms. They substituted for an interest in it as faith an interest rather in the exotic mental processes and conceptual framework of those whose lives had been sustained and enriched by it. . . . What had been a relation between the human and something external and higher . . . was transformed by the new thinking into a self-subsistent, mundane operation of the mind. . . . To imagine that religious persons "believe" this or that is a way of dominating intellectually, and comfortably, what in fact one does not truly discern. (W. C. Smith, 1998a, p. 144)

With regard to the religious-spiritual distinction: Faith need not refer to religious faith. Faith as involvement in a symbol system meant to define and support the good life, such faith can be entirely secular faith. For example, one legacy of classical Greece and Rome has been a secular faith, which is, says Smith:

> a living tradition with its own metaphysical underpinning, its own great champions and even martyrs, its own institutions, its own apprehension of or by transcendence, and, . . . its own type of faith. (1998a, p. 134)

Using Smith's conception of faith, we gain one way of understanding what religiousness and spirituality have in common: They are both grounded in faith.

Content, Form, and Function

The last set of commonly accepted distinctions is the most difficult to explain, yet it may be the most crucial for defining religious and spiritual development. Our goal here is not simply to define what content, form, and function mean with regard to religious and spiritual development. Rather, our goal is also to define how these three, taken together, point us in the direction of adopting a structural definition and explanation of religious and spiritual development as development of *persons.* While there is general agreement over what we should mean by content, form, and function, there is no such agreement over what we should mean by structure and structural development. Beginning with what we can agree on may help clarify what we should mean by religious and spiritual structural development.

To illustrate distinctions between content, form, and function, we use the phenomenon of personal prayer (Scarlett & Perriello, 1991). Personal prayer, as distinct from the generally impersonal group prayers said during religious services, offers a reasonable way to illustrate distinctions, because personal prayer is both widespread and clearly religious in nature—particularly when individuals invest their prayers with feeling. Furthermore, with age, personal prayers not only change but also develop. We focus mostly on petitionary personal prayers because, of the various types of prayers, they are by far the most common.

Prayer's content refers to the specific themes, ideas, and beliefs contained in prayer. Prayer may be about healing, avoiding danger, hoping for success—almost anything and everything. It may be about gods, ancestors, or patron saints. It may be about something as small and petty as finding a parking space or as large and noble as achieving world peace.

The variety of contents found in phenomena such as personal prayer points to both the value and limitations of understanding religious and spiritual development in terms of its content only. On the one hand, content provides a window on special circumstances, on what is on an individual's mind, and on how an individual may be thinking in ways characteristic of his or her family, community, and culture. On the other hand, the infinite variety in content limits its value for defining development in terms of content only. How, for example, should we distinguish developmentally between prayer directed to a single divinity and prayer directed to gods or ancestors? Given that there are no agreed on criteria, we should not.

Nevertheless, content figures into analysis of religious and spiritual development in general and the development of prayer in particular—both to the extent that content occasionally supports criteria for defining religious and spiritual maturity (e.g., acting in self-disinterested ways, pursuing noble purposes) and to the extent that content reveals something about the overall structuring of content, form, and function. So, for example, when the content of petitionary prayer includes statements such as "If it be your will . . .," then the content makes explicit that the praying individual sees the possibility of there being alternative perspectives or wills—a measure of decentering and therefore of development. It is reasonable to treat petitionary prayers that make this possibility explicit as being more developed than petitionary prayers that do not, all other things being equal.

A better indicator of developmental differences has been, generally, differences in *form.* With respect to prayer, there are the differences in types—petitionary, confessional, thanksgiving, and so on—and presumably development has something to do with recognizing, understanding, and being able to use each type. However, in each type, there are different forms that have different developmental meanings. For example, two confessional type prayers may each contain specifications of the same transgression, say, lying. However, only one of the two may specify a plan for becoming honest. Adding the plan is more than adding content. It is making confessional prayer into a more developed form, a form that is more differentiated with respect to its parts. With the example of prayer containing "If it be your will . . .," the added content is not clearly an added part making the prayer into a more differentiated whole. The added content is, rather, an indicator of an underlying attitude and understanding of the relationship between person and the agency to which the prayer is directed.

With regard to *functions,* prayer also provides examples. By definition, petitionary prayers serve the explicit function of making requests. However, a closer inspection reveals petitionary prayers sometimes serve additional functions as well. Furthermore, these additional functions can sometimes help define development. For example, a child and an adult may both pray for a sick relative to get well. However, the adult may add something

about not knowing what to do if things turn out for the worse, if the sick relative dies. This little addition suggests prayer serves the added function of helping the praying individual to figure out, puzzle, or search for ways to understand or frame a crisis. This searching function is hardly ever found in children's prayers and may only occasionally be found in the prayers of adults—which tips us off to its being a function that can help define development.

Therefore, by analyzing and evaluating separately the content, form, and functions of religious and spiritual phenomena, such as prayer, we often gain a better understanding of religious and spiritual development. However, in doing so, we still are not able to define and explain how individual persons develop. For this we need the concepts of *stage* and *structure*.

Stage and Structure

The concepts of stage and structure offer indispensable means for defining and explaining the religious and spiritual development of persons. They do so first in the way they organize content, form, and function to reveal the full meaning of the religious and spiritual life. Attending to content, form, and function separately or in sequence can lead to overlooking the central characteristics that distinguish mature from immature—the hidden structure that allows us to not only evaluate individual acts but also to evaluate the development of persons.

Stage and structure also offer means to explain the dynamic nature of religious and spiritual development. In the previously cited example of adding functions to petitionary prayer, we see a transformation in the self's structured way of being in the world—from being in the world as a self depending on some divine power to resolve crises to being in the world as a self acting in concert with a divine power. The change from one to the other is neither arbitrary nor random. Rather, the change has profound meaning for adaptation—which is a major reason why we judge the second way of structuring to be more developed.

This view of stage and structure differs markedly from the views of current critics of stage theory—including critics of religious and spiritual stage theories. Post-Piagetian critics have dismissed stage-structural theory primarily for not providing an adequate account of variability and not accounting for transition processes. However, recently, a number of theorists have answered the critics and in so doing, have revitalized stage-structural theory. David Henry Feldman's (in press) discussion bears special mention.

After outlining each of the main criticisms of Piaget's stage-structural theory, D. H. Feldman proposes ways to answer the criticisms and retain stage as a useful, even indispensable explanatory concept. His main suggestions include the following two, which we take to be the most central.

The first major criticism of stage-structural theories such as Piaget's is that they do not account for the wide variation in behavior one finds in any given stage. D. H. Feldman answers this criticism by suggesting we think of a stage as consisting of two substages—with the first substage devoted to constructing the stage and with the second devoted to extending and applying the stage's system as widely as possible. Stages are marked by their midpoints.

Using this way of thinking, stages emerge only gradually and are only gradually replaced as the effort to extend and apply begins to fail. In other words, stages need not be thought of as structured wholes, which snap into place at particular moments in development. There is an ebb and flow to their development, and variability in behavior or patterns of behavior, rather than undermining the notion of stages, is another indicator of their development.

The second major criticism of stage-structural theories is that they do not provide adequate accounts of transition mechanisms. In the case of Piaget's stage theory, equilibration as a transition mechanism bears too much of the burden for explaining transitions. D. H. Feldman answers this criticism by suggesting we keep Piaget's equilibration mechanism but give more emphasis to other mechanisms to explain transitions—including maturation and learning.

Suggestions such as D. H. Feldman's (in press) allow us to hold on to the concepts of stage and structure to define and explain religious and spiritual development. Once again, we find there is no reason to throw out the baby with the bath water.

In sum, content, form, and function are commonly accepted concepts and distinctions used for defining and evaluating religious and spiritual development. However, when used by themselves, they do not adequately account for the development of persons. Stage and structure are less commonly accepted concepts. However, if used in ways that address the main criticisms of stage-structural theories, stage and structure

become indispensable concepts for defining and explaining the religious and spiritual development of persons.

The neo-Kantian philosopher, Ernst Cassirer, provides an example of how stage-structural analysis can be indispensable in defining, evaluating, and explaining the religious and spiritual development of persons. For Cassirer, at the lower stages of religious and spiritual development, individuals live in a mytho-poetic world where symbol and referent are fused and where there is no distinction between meaning and existence (Cassirer, 1955). Cassirer distinguishes between mythical and religious consciousness with the latter being more developed. However, myth (a tradition's imagination) and religion are inseparable. Cassirer writes:

> If we attempt to isolate and remove the basic mythical components from religious belief, we no longer have religion in its real, objectively historical manifestation; all that remains is a shadow of it, an empty abstraction. Yet, although the contents of myth and religion are inextricably interwoven, their form is not the same. And the particularity of the religious form is disclosed in the changed attitude which consciousness here assumes toward the mythical image world. It cannot do without this world, it cannot immediately reject it; but seen through the medium of the religious attitude this world gradually takes on a new meaning.
>
> The new ideality, the new spiritual dimension, that is opened up through religion not only lends myth a new signification but actually introduces the opposition between "meaning" and "existence" into the realm of myth. Religion takes the decisive step that is essentially alien to myth: in its use of sensuous images and signs it recognizes them as such—a means of expression which, though they reveal a determinate meaning, must necessarily remain inadequate to it, which "point" to this meaning but never wholly exhaust it. (p. 239)

In Cassirer's account, we see how important structural differences can be for defining what is essential in religious and spiritual development. For Cassirer, it is the transformation from living in a mytho-poetic world to living in a world where the myths and poetry of faith traditions become symbols pointing to truths to live by. Others who engage in stage-structural analysis find different ways to characterize what is essential. Whatever the ways, the effort is the same, explaining not only the development of acts, thoughts, and feelings but also explaining the development of persons. In general, critics forget that stages and structures are heuristic instruments for understanding this development: They are frames of mind and heuristics of beliefs, not tangible realities.

Having explained the rationale for using the concepts of stage and structure, we turn now to discussing specific stage-structural theories of religious and spiritual development.

STAGE-STRUCTURAL THEORIES

The stage-structural theories to be discussed here are all in the constructivist tradition associated with the work of Jean Piaget. Because Piaget's theory focused on epistemology and cognitive development, stage-structural models of religious and spiritual development are often criticized for being too cognitive. Critics assume that any off-shoot of Piaget's theory is also bound to be too cognitive.

It is ironic that few know about Piaget's early reflections on religious and spiritual development—what is generally understood to be a Piagetian approach to religious and spiritual development is not at all Piagetian. We begin with a brief summary of Piaget's actual approach to religious and spiritual development to better frame the discussion of stage-structural theories.

From his late teens until his early 30s, Piaget preoccupied himself with the question of how one can believe in God and remain objective (Reich, 2005). His questioning led to a significant development in his thinking: to his distinguishing between a transcendent and immanent God. For Piaget, God initially meant the God of conservative theology—a transcendent and mysterious God whose laws must be followed slavishly. Over time and in the context of actively debating and discussing, Piaget developed a very different meaning of God so that eventually God, for him, went inward. In rejecting transcendence in favor of immanence, Piaget came to identify God with the heart, with the norms of reason, and with the internalized example of Jesus.

Piaget's model of religious development centered around a transformation from transcendent to immanent meanings of divinity. This transformation was far more than a cognitive transformation and certainly more than developing faith in reason. To be sure, reason was there in his model but also the heart and a faith tradition. He makes this clear in a lecture he gave in 1929, to members of the Swiss Christian Students Association:

> if, beyond men, one examines the currents of thought that propagate from generation to generation, immanentism appears as the continuation of the impulse of spiritualization that characterizes the history of the notion of divinity. The same progress is accomplished from the transcendental God endowed with supernatural causality to the purely spiritual God of immanent experience, as from the semi-material God of primitive religions to the metaphysical God. Now—and this is the essential point—to this progress in the realm of intelligence corresponds a moral and social progress, that is, ultimately an emancipation of inner life. (Vidal, p. 287)

Piaget never developed a research program to test out his developmental theory of religious and spiritual development. Whatever the reasons may be for Piaget's abandoning his public reflections on religious and spiritual development, his early discussions clearly indicate that a true Piagetian approach to religious and spiritual development demands much more than attending to cognition and reasoning.

However, in the early 1960s, when Piaget's cognitive developmental theory was eclipsing all other theories of cognitive development, Piaget's early reflections were virtually forgotten. The result was an application of Piaget that was not at all Piagetian and that was indeed overly cognitive. The clearest example is the work of Ronald Goldman.

Cognitive-Stage Theories: Ronald Goldman

Goldman's (1964) classic study "Religious Thinking from Childhood to Adolescence" is a landmark in the research on religious development. The main concern of the book is ultimately derived from the pedagogy of religion: "To know what a child is able to grasp intellectually is a surer foundation for education than to know only what adults feel the child ought to grasp" (p. xi). Goldman referred to the decisive work of Jean Piaget—not so much to Piaget's early work, "The Child's Conception of the World" (1929), which investigated children's theories—and the stages of cognitive development. In so doing, Goldman adopted the position that, "Religious thinking is not different in mode and method from nonreligious thinking. Religious thinking is . . . the activity of thinking toward religion" (p. 3).

Unlike earlier studies in the psychology of religion, which merely described children's religious concepts without explaining them, Goldman's approach had the advantage of treating diverse impressions of children in a theoretically based sequence. Goldman asked children and young people about their religious conceptions such as "God's omnipotence," "the Bible," and "Jesus." He also asked children about their interpretations of three biblical stories: Moses and the burning bush, the crossing of the Red Sea, and the temptation of Christ. He assigned children's interpretations to three stages of religious cognition and matched them to Piaget's stages of cognitive development—as indicated in Table 17.1.

From this summary table, we see that Goldman conceptualized mature religious thought moving beyond the "childish and immature religious ideas of children" (p. 67) to be capable of seeing the symbolic-metaphorical structure of religious language in general and biblical language in particular. Using the findings of his research, Goldman drew provocative consequences for the peda-

TABLE 17.1 Stages of Piaget and Goldman Compared

Piaget	Goldman
Preoperational	Intuitive Religious Thought Religious contents comprehended unsystematically, fragmentarily, frequently in a magical way, God represented anthropomorphously; frquent transductive conclusions: "Why did Moses not go to the bush?" "Because there was a sign saying 'Keep off the Grass.'"
Concrete operational	Concrete Religious Thought Magical and animistic elements receding; religious concepts presented in a more coherent and objective way—though their symbolic-metaphorical nature not yet apprehended: "The burning bush had a fire behind it, it only seemed to be burning."
Formal operational	Abstract Religious Thought Religious contents now reflected in a hypothetical-deductive manner with symbols recognized as symbols: "The burning bush is a symbol that God is there."

gogy of religion, notably that children should no longer be confronted with the Bible because they glaringly misunderstand biblical texts.

Goldman inspired an abundance of studies replicating his work (see reviews by Hyde, 1990, p. 15–63; Slee, 1986a). Peatling's (1974) multiple-choice test and his devised "Thinking about the Bible Test" became widely known and used. Other psychologists of religion made use of the semi-clinical interview (Elkind, 1964), and they also applied Piaget's cognitive stages to religious concepts. The overall picture painted was that, with increasing age, concrete modes of thinking recede and are replaced by more abstract religious thinking (e.g., Tamminnen, 1976).

However, even while Goldman inspired others to apply Piagetian stage analysis to religious material, he also drew widespread criticism. His work was criticized for its faulty methods (Langdon, 1969; Slee, 1986a, 1986b). For example, religious semantics can be more appropriately based on word choice procedures than on interview questions foreign to children's natural ways of thinking (Murphy, 1978). Furthermore, research showed that abstract religious thought coincides positively not with the acceptance of religious, particularly biblical, contents but with rejection of that content (Hoge & Petrillo, 1978), and children's understanding of biblical content is more adequately explained by other stage-structural theories such as Oser and Gmünder's (Bucher, 1991).

More recently, cognitive scientists informed by research on "theory of mind" as well as by cognitive anthropology, have questioned Goldman's work for overstating differences between children's and adult's ways of thinking about religion. On the one hand, children's thinking about counterintuitive religious concepts, such as the concept of an all-seeing God, must be judged in the context of children's intuitive psychology and in the context of what adults teach children about religious concepts. When so judged, children's thinking appears far more reasonable and sophisticated than Goldman's theory leads us to believe (Boyer & Walker, 2000; Harris, 2000). On the other hand, adults often give theologically correct answers to questions about religious concepts, but, in their own personal lives, they function with religious concepts not altogether different than what Goldman ascribed to children (J. Barrett & Keil, 1996). We have more to say about this line of criticism when discussing research on children's religious concepts.

By far, the most common criticism of Goldman's work has been directed at Goldman's essentially narrow cognitive focus. Critics have pointed out that religious consciousness includes far more than what is implied in Goldman's research, particularly with regard to the use of religious symbols (Godin, 1968b). A special problem is that Goldman did not deal with the development of religiousness, *sui generis,* but rather with cognitive structures to the extent that they rub off on religious content.

Probably as a reaction to Goldman's overestimation of cognitive processes, the first empirically based theory of religious and spiritual development of the 1980s was holistic in nature and included social, moral, religious, spiritual, and identity formation parts and treated faith as having a much broader meaning than belief. It is this theory of James Fowler that we discuss next.

Faith Developmental Theory: James Fowler

Fowler's focus is broad because his view of faith is broad. Following the lead of theologians Paul Tillich, H. Richard Niebuhr, and Wilfred Cantwell Smith, Fowler (1981) defines faith as a universal quality of persons, a quality defined by the way persons orient themselves in the cosmos and, at higher stages, in an ideal, yet-to-be-achieved or experienced ultimate environment. In Judeo-Christian thinking, this ultimate environment is defined as the "kingdom of God," the endpoint of human history. Faith so defined is reflected in how individuals make or find meaning, how they define centers of value and power, and how they adopt symbols and stories to reveal or express their faith. For Fowler, faith is far more than belief or reasoning.

Fowler's (1981) focus is also broad because faith developmental theory is intent on capturing the overall psychological development of persons. His theory borrows heavily from Erikson, Piaget, and Kohlberg, and to a lesser extent from Sullivan, Stern, Rizzuto, and Kegan. His stages take into consideration an individual's development with respect to major developmental tasks including identity achievement, cognitive development, moral judgment, symbol formation, social perspective taking, and locus of control. For Fowler, the development of faith and the development of persons are so intertwined as to be, to a large extent, one in the same.

At the heart of Fowler's (1981) view of faith development is the issue of individuation in a pluralistic society.

From this view, the central dilemma for individuals is that of being true to ourselves, our feelings, intuitions, beliefs, and understandings, while, at the same time, maintaining or constructing ethical, positive relationships with increasingly diverse communities.

At first, this dilemma is played out in the family and with one's inherited extra-familial community and faith tradition, then with self-consciously adopted communities and faith traditions, and, ultimately, with the community of humankind. As with Oser and Gmünder's (1991) stage theory, Fowler's faith developmental theory is meant to define an ideal sequence (paradigm of perfection). Only a few reach the highest stage.

Fowler's way of construing faith and human development shows in the descriptions of his stages of faith development. Table 17.2 provides a brief overview of those stages (Fowler, 1981).

Fowler's stage model was applied to transcripts made following two-hour interviews with over 350 subjects. The interviews made use of a "Faith Development Instrument" designed to elicit and support discussion directly relevant to getting at subjects faith, as faith was defined by Fowler.

The results of Fowler's (1981) own research indicated that almost all of the preschoolers in the sample had an intuitive-projective faith; almost three quarters of the elementary school children had a mythic-literal faith, and almost half of the adolescents interviewed had a synthetic-conventional faith. Among adults, the variance was greater, with 40% younger than 30 having an individuative-reflective type of faith and 18% having a synthetic-conventional type. Conjunctive faith was rare and occurred only after age 40. There was only one subject categorized as having a universalizing type faith.

There have been at least 11 empirical studies replicating Fowler's original study, and 26 others using the faith development interview technique (Streib, 2001). Several cross-cultural studies provide inconclusive evidence about the suitability of Fowler's stages for studying faith development in non-Western cultures. Part of the difficulty has been in using the faith development interview method. Attempts to devise a shorter method to measure faith development have not been successful.

Since conducting his study in the 1970s, Fowler (1981) has focused more on making faith developmental theory useful for practitioners, particularly in the fields of pastoral counseling and religious education. However, he has continued to modify the theory in response to criticisms. Concerning gender bias and overemphasis on

TABLE 17.2 Fowler's Stages of Faith Development

Stage One: Primal Faith (Infancy)
Prelinguistic faith defined by the trust developing between infants and their caregivers and by the psychological bonds created through affect attunement.
Stage Two: Intuitive-Projective Faith (Early Childhood)
Faith defined by the images created to represent both threatening and protective powers, by representations of God that derive from experience with significant caregivers, by the awakening of moral standards, and by continued reliance on and referencing to caregivers.
Stage Three: Mythic-Literal Faith (Elementary School Years)
Faith defined by widening sources of authority to include those outside the family so as to create a community of like-minded, by the appreciation of myths and narratives taken literally and valued for their ability to explain and express faith, and by anthropomorphic images/conceptions of God.
Stage Four: Synthetic-Conventional Faith (Adolescence and Adulthood)
Faith defined by the development of a worldview derived from conventionally or consensually sanctioned authorities, by self-identity forming a synthesis of the perceptions of others so that identity is defined in terms of belonging (to family, ethnic group, sex role, religion) and/or possessing, and by undeveloped ability to understand and identify with groups with worldviews different from one's own.
Stage Five: Individuative-Reflective Faith (Late Adolescence to Adulthood)
Faith defined by the self-conscious, explicit examination of commitments, beliefs, and values leading to critical examination of the individual's faith heritage and a self-conscious choosing of the faith tradition and community to which the individual belongs. Faith at this stage indicates the individual takes charge of his/or life in defining self and commitments – often limiting the individual's ability to connect to faith-based groups and faith traditions and to take the perspective of alternative groups.
Stage Six: Conjunctive Faith: (Average Age: About 30)
Faith defined as self-conscious commitment to ethical action based on fully internalized principles and to a vision of meaning, coherence, and value that fully accepts the limitations of the self to understand fully and act purely. Faith at this stage is maintained without the props of external authority and may be described as paradoxical faith inasmuch as commitments are made in the context of self-doubt and despair that allows for appreciation of alternative perspectives but threatens passivity and inability to act.
Stage Seven: Universalizing Faith: (Average Age: Minimum about 40)
Faith defined as overcoming paradox through identifying with the ultimate conditions of existence ("kingdom of God"). Faith at Stage Seven often appears to be simple compared to faith at Stages Five and Six. Self and other are, at Stage Seven, viewed and understood from a cosmic, transcendent perspective which allows for the feeling of unity and meaning.

autonomy issues at stage four, Fowler has placed more emphasis on relational knowing to characterize faith at stage four, and in response to criticisms concerning cultural bias, Fowler has placed greater emphasis on the deconstructing power of specific cultural contexts, which call for more emphasis on faith development being viewed in the context of culture and needing specific conditions for development to proceed beyond the lower stages.

More recent stage-structural theories of development refer again to Piaget's and Kohlberg's conceptions of growth; however, instead of considering religious and spiritual experiences only as they reflect general stages of logical thinking and cognition, these newer theories consider genuine religious experience, feelings, and convictions as they reflect religious judgment, reasoning, and cognition. Clear examples occur in the research of Oser, Gmünder, and Reich—which we discuss next.

Stages of Religious Judgment and Reasoning: Fritz Oser and Paul Gmünder

Goldman's research was on judgment and reasoning about religious content and concepts. Oser and Gmünder's research is on religious judgment and reasoning about unspecified content (Oser & Gmünder, 1991). The distinction is important. In Goldman's case, judgment and reasoning was the issue and religion was the content. In Oser and Gmünder's case, religiousness is the issue and judgment and reasoning is a means to understanding religiousness. In Goldman's case, the focus is on the cognitive domain. In Oser and Gmünder's case, the focus is on the religious domain. Here, we see religious judgment and reasoning treated as a "mother structure" or way of thinking that cannot be reduced to some other way of thinking.

However, because religious judgment and reasoning constitute judgment and reasoning about something, the question arises as to what religious judgment and reasoning are about. For Oser and Gmünder (1991), religious judgment and reasoning are not about meaning-making of all life, but from a measurement point of view are most apt to be about resolving ambiguities elicited in particular kinds of situations, here described as *contingency* situations.

Contingency situations elicit religious judgment and reasoning primarily because they raise questions about who or what is ultimately in control and also about a variety of conflicts having to do with a person's relationship to an ultimate being or reality. With contingency situations, there is ambiguity, which can be resolved through a special kind of interpreting that Oser and Gmünder (1991) identify as being religious or spiritual in nature. This chapter opened with such an example—the example of one person interpreting another's good fortune as having a religious meaning. Other examples include interpretations of misfortune. Therefore, studying reactions to contingency situations offers one way to understand the development of religious judgment and reasoning.

Oser and Gmünder's (1991) focus was on the qualitatively different ways that individuals reason religiously about the conflicts elicited by existential contingency situations. Contingency situations are not controllable in human life. They stimulate the beginning of religiousness, but they also stimulate conflicts in persons, which are defined as polar opposites needing to be differentiated and coordinated. Each polar opposite defines some issue that may be brought to bear when interpreting a contingency situation. As noted in Table 17.3, Oser and Gmünder list several polar opposites as central.

These polar opposites can be used to reason about how best to interpret and react to contingency situations. They function in ways similar to the Kantian categories of thinking (time, space, causality, etc.) needed to organize thinking in general.

From a genetic point of view, at lower stages of development, individuals choose only one of the polar opposites. Either they are dependent, or they are free. Either they are in a holy space or in a profane space—and so forth. By adolescence, individuals usually consider both polar opposites simultaneously. There is trust and mistrust, transcendence and immanence, and so on. Furthermore, each polar opposite is seen as having meaning in life. Here is transcendence, and there is immanence, and both can be at the same time. Later, at higher stages of development, one polar opposite can be taken as a

TABLE 17.3 Polar Opposites to Be Coordinated for Religious Judgment and Reasoning

Freedom versus dependence
Transcendence versus immanence
Hope versus absurdity
Transparency versus opacity
Eternal versus ephemeral
Trust versus mistrust
Holy versus profane

fundamental condition for the other, so, for example, the experience of absurdity can become a condition for experiencing hope, and freedom can become a prerequisite for experiencing healthy dependency.

But what exactly does reasoning with the aid of seven polar opposites organize and accomplish? Oser and Gmünder's (1991) answer is that it helps define how individuals understand their relationship to God or to whatever individuals owe a commitment. Because some faith traditions speak of a collection of personal agencies (gods, ancestors, etc.) while others speak of an impersonal force or reality (dharma, Tao), Oser and Gmünder referred to the person-"Ultimate" relationship—with ultimate referring to that which one owes commitment to ultimately. For example, devote Buddhists often treat dharma (cosmic law) as an Ultimate reality to which one owes commitment (W. C. Smith, 1998a).

A clear example of how the polar opposites figure into reasoning about the person-Ultimate relationship occurs when individuals, faced with contingency situations, reason about how free and/or how dependent they are with respect to a higher power or reality. Contingency situations are, after all, situations that raise questions about control. The main assumption here is that reasoning well about the person-Ultimate relationship leads to more adaptive ways of living that serve not only the individual but also those around the individual.

This does not mean that less developed ways are necessarily less adaptive—because adaptation is always a matter of the match between person and context. A child's way of reasoning may be perfectly matched to his or her protective surroundings. The theory suggests that it is adaptive for children to reason religiously as if there are no apparent conflicts created by the presence of evil, tragedy, and injustice. However, it is not adaptive for adults to reason without taking into account these and other conflicts. In short, for adults, the standards for adaptive behavior are higher.

Furthermore, saying development is about adapting does not mean that immature ways need to be discouraged. On the contrary, the model suggests that most of the time, religious reasoning is directed toward adapting and is open to being modified and transformed as the need arises. Refer back to the previous section's comments about consolidating and expanding phases in stages as well as to transition mechanisms, and Oser and Gmünder's stage approach becomes clearer.

What development of religious reasoning means is that, with development, individuals are more able to adapt to a wide variety of contexts or situations—not just to the narrow set of contexts and situations experienced in, say, childhood. Furthermore, development here is assumed to help prevent negative dependency, dogmatic positions, intolerant behavior, and aggressive forms of religious expressions.

What development and adaptation mean differs according to theoretical perspective, as we see in the next section. Here, development is defined as structural development and approximations to an ideal endpoint (paradigm of perfection). In other theories, development may be defined more as content, intensity, and adaptation to specific circumstances (paradigm of coping).

Two further comments to clarify the stage theory of religious judgment: First, though the focus here is on contingency situations, the theory suggests that religious judgment and reasoning may occur in a wide variety of situations, not just contingency situations. William James' saints were, after all, continually judging and reasoning religiously. Second, though the theory refers to religious judgment and reasoning, the term *spiritual judgment* and reasoning could work just

TABLE 17.4 Stages of Religious Judgment in the Oser and Gmünder (1991) Model

Stage 1: Orientation of Religious Heteronomy—Deus ex Machina
God (the Ultimate) is understood as active and as intervening unexpectedly in the affairs of the world; persons are conceived as mostly reactive to God's (the Ultimate's) power and interventions.
Stage 2: Orientation of Do et Des—"Give so you may receive"
God (the Ultimate) is understood to be external, all-powerful, and intervening, however, God (the Ultimate) now can be influenced through promises, prayers, and deeds.
Stage 3: Orientation of Ego Autonomy and One-Sided Responsibility
The influence of God (the Ultimate) is consciously reduced. The individual is conceived of as responsible for his or her own life. The Ultimate Being (if accepted as real) has a separate and hidden existence and responsibility/function.
Stage 4: Orientation of Mediated Autonomy
God (the Ultimate) is mediated through immanence—as in developing faith in a divine plan and living life accordingly. Social engagement becomes a form of religious/spiritual expression.
Stage 5: Orientation of Unconditional Religiosity
The individual feels that he or she is always and unconditionally related to the Ultimate Being—so that each moment is or can have a religious/spiritual dimension. Religious and spiritual reasoning displays complete differentiation and coordination of the seven polar opposites.

as well—especially given the fact that certain kinds of atheism and agnosticism retain notions of a person-Ultimate relationship.

This brings us, at last, to the heart of the theory: to how the polar opposites become increasingly differentiated and coordinated and created stages defining how individuals understand their relationship with an Ultimate being. Table 17.4 lists the stages and provides brief descriptions.

Again, independent of the religious denomination (jewish, catholics, protestants):

- At the lower stages, there is little or no effort to coordinate the polar opposites. Either God (the Ultimate Being) intervenes, or He (It) does not intervene. Either we feel hopeful, or we do not feel hopeful. Either an event reveals God's (the Ultimate Being's) will or that will remains inscrutable. And so it goes with the rest of the polar opposites, as individuals continue to think in "Either . . . or . . ." terms.
- At middle stages, polar opposites become differentiated and opposed to one another—without there being a way to coordinate or balance them. For example, at a middle stage, individuals may see themselves as free to make their own choices while, at the same time, they may feel that God (or the Ultimate Being) is simultaneously doing the same, possibly in opposition to what they are doing.
- At higher stages, the polar opposites interpenetrate one another so that, for example, freedom is achieved through remaining dependent on God (the Ultimate Being); transcendence emerges indirectly through concrete actions so that immanence and transcendence are intertwined, and transparency and opacity become integrated as indicated by phrases such as, "We see, but through a glass darkly." (1 Corinthians 13:12, New Revised Standard Version). With respect to the polar opposites, what were originally experienced as conflicting opposites come to be experienced as integrated dualities that define religious and spiritual experience.

Oser and Gmünder's (1991) stage theory of religious judgment was developed, tested, and validated using a semistructured clinical interview method that asked subjects to respond to hypothetical contingency situations. The best known of these situations is the "Paul dilemma." Subjects are first told the story of a young man caught in a plane about to crash. The young man promises God that, if he survives the crash, he will forego a promising career and serve humanity in a third world country. Paul survives, and subjects are asked to respond to a series of questions to elicit reasoning about Paul's promise, whether he should keep his promise toward God, what will happen if he doesn't, and how, in general, he should think and behave in reaction to his surviving the crash.

A coding manual allowed subjects' responses to the Paul dilemma and to other hypothetical dilemmas to be evaluated in terms of the seven polar dimensions—and allowed for subjects to be assigned to a particular stage of religious judgment. Here are typical responses to the question of whether Paul should keep his promise:

Stage One: "Paul has to keep his promise, otherwise God will give him a stomach ache."

Stage Two: "God helped Paul so Paul now has to do some good." Or, "If Paul does not keep his promise, he has to do something else. He has to pray so that he won't be punished."

Stage Three: "This has nothing to do with God. Paul has to make his own decision. God, if he exists, has other problems."

Stage Four: "Whatever decision Paul makes, he will likely use his faith in God to act responsibly—because acting responsibly is really what is God's will. And, in the end, things will be okay."

Stage Five: "Whether he goes (to serve in a third world country) or does not go is unimportant; what is important is that Paul fulfills the larger promise to meet the many challenges he will face throughout life, in the light of what he gathers to be God's will. God is present in every human communication and so it does not matter where exactly Paul ends up."

Again, no single answer or response was enough to assign a subject to a particular stage. It was the collective response that determined how subjects were assigned to stages.

The results of the original and subsequent studies have proven the usefulness of this stage model for (a) describing age changes, (b) understanding religious behavior, (c) looking at conversion experiences, and (d) establishing the value and significance of developing religious judgment and reasoning.

With respect to age changes, significant age trends were established with European samples, not only in cross-sectional studies (Oser & Gmünder, 1991), but

also in longitudinal studies as well (Di Loreto & Oser, 1996). Together, the cross-sectional and longitudinal studies suggest that children and adolescents normally progress through the first three stages of religious judgment. After adolescence, the majority of adults remain at stage 3. This finding may be explained, in part, by cognitive development being the prime transition mechanism at lower stages (e.g., developing capacity to reason about contradictions) while emotional development figures more in the transitions at higher stages (Beile, 1998).

These findings were replicated in sociocultural contexts as different as India (Hindu and Buddhist), Tibet and Rhwanda (ancestor worship; Dick, 1981). Another finding is that in adolescence, girls score higher than boys—though the differences are small and disappear with the transition to adulthood (Reich, 1997; Schweitzer, 1992).

As for the usefulness of the stages for understanding religious behavior, the stages shed light on individual differences in (a) involvement in religious communities, (b) interpretations of religious texts, and (c) self-effectiveness in religious beliefs.

With respect to involvement in religious communities, individuals at stages 1 and 2 are more likely to prefer religious communities that require unconditional subservience from members, but individuals at higher stages are more likely to prefer liberal communities (Zondag & Belzen, 1999). Furthermore, individuals at stage 2 are more likely to have stronger ties to religious institutions, attach greater importance to sacraments, and expect more support from religion (Kager, 1995). Finally, with respect to religious communities, persons at lower stages are more likely to prefer religious bonding relationships analogous to the mother-child relationship, but persons at higher stages are more likely to prefer such relationships to take the form of cooperating friends (Kager, 1995).

With respect to interpretation of religious texts, individuals at stages 1 and 2 tend to understand religious language literally rather than metaphorically or symbolically (Zondag & Belzen, 1999)—and in a manner consistent with their *do ut des* orientation. So, for example, individuals at stage 2 tend to interpret miracles reported in the Bible as pay-back for biblical figures being good, and parables such as the parable of the workers in the vineyard who received a full day's pay for working only an hour were interpreted as showing that God rewards good work (Bucher, 1991).

With respect to conversion experiences, conversions into open, but not into closed, narrow religious groups are associated with stage development (Wenger Jindra, 2004).

With respect to self-effectiveness in religious beliefs (SEB), individuals at stage 3 show considerably less SEB than do individuals at lower and higher stages (Rollett & Kager, 1999). SEB is strongest at stage 2, which is consistent with the overall stage 2 orientation emphasizing the influence that individuals can have on God or the Ultimate Being.

As for the value and significance of developing religious judgment, three studies suggest that stages may influence how individuals cope with adversity and come to think positively. In one study of parents with either Down syndrome or autistic children, parents at higher stages were more likely to use social support than were parents at stage 3 (Gnos, 2003). In a similar vein, another study provided evidence that widows were overcoming sadness at a higher stage level than non-widows, suggesting that, for at least some widows, stage development may occur to cope with the death of a spouse (Zenklusen, 2003). Finally, in one study, stimulating the development of thinking about content with spiritual meaning had direct effects on social consciousness and on well-being (Blakeney & Blakeney, 2005).

Therefore, Oser and Gmünder's (1991) stage theory has proven useful and in a number of ways. In particular, the theory has proven useful for understanding how religious judgment and reasoning figure into overall religious development.

Fowler and Oser and Gmünder's Theories Compared

The similarities between the theories of Fowler (1981) and Oser and Gmünder (1991) are evident. Both are indebted to genetic structuralism. Both are in the tradition of the Enlightenment. Both describe a development that leads from the particular to the universal and from heteronomy to autonomy. Both establish significant age trends, and the stages from both theories, to a certain extent, parallel one another. For example, in a direct comparative study by Tamminnen (1994), results showed that in the adult age group, most subjects were at stage 3 in Oser and Gmünder's scheme and at the parallel stage 4 in Fowler's. Notwithstanding these similarities, there are differences (for a fuller discussion, see Nipkow, Schweitzer, & Fowler, 1988).

First, Fowler (1981) incorporates into his scheme of stages many different kinds of psychological elements, including moral and social elements, the development of

self-hood and self-identity, type of thinking, and comprehension of symbols. In contrast, Oser and Gmünder (1991) concentrate on religious matters only to the extent they can be used to cope with life in the face of the Absolute or Divine.

Fowler speaks of faith in a very general sense, which has attracted the criticism that we are dealing here with an "everything and nothing view of faith" (Fernhout, 1986, p. 66). In contrast, Oser and Gmünder (1991) speak of religious judgment for establishing control in a situation of life through a person's regulating the relationship (bounding) between him- or herself and the Absolute.

Fowler (1981) views the normative goal of religious education in terms of the biblical metaphor of the kingdom of God (or "reigning of God"), whereas Oser and Gmünder (1991) view this goal as not determining the characteristics of stages.

While Fowler's (1981) approach may be more suitable for raising questions related to life history and existential themes, Oser and Gmünder's (1991) approach is more about the transformation dynamics of cognitive structures. Fowler is more interested in the implications of his stage theory for supporting pastoral care, while Oser and Gmünder are more interested in scientific issues such as the issue of validating stages.

Approaches have their own history and their own advantages and drawbacks. Oser and Gmünder's (1991) approach is admittedly less explanatory and more sharply focused on God-man connectedness, but this could be interpreted as a strength. Fowler's (1981) approach is more faith related and thus more holistic, and this, too, can be seen as strength. Therefore, to a certain extent, these approaches or theories serve complementary roles for understanding religious and spiritual development.

The Relational and Contextual Model of Development: Helmut Reich

There are numerous religious phenomena calling for more specialized reasoning than that explained in the Oser and Gmünder's (1991) stage model. In particular, there are religious dogmas and religious conflicts that raise intellectual challenges for any believer who feels obligated to think logically and scientifically. These more specific challenges call for the development of a specialized way of reasoning that Reich (1993) has named relational and contextual reasoning (RCR).

RCR reasoning is useful in situations involving competing, bona fide explanations. It is useful because of its underlying trivalent logic, which can lead to categorizing competing explanations as being compatible, incompatible, or noncompatible. Noncompatible refers to instances when competing explanations are both (all) correct, *depending on context.*

Using the construct of RCR and working in the framework established by Oser and Gmünder (1991), Reich's (1993) research has focused on how individuals develop ways to resolve apparent contradictions having religious meaning. Examples include the problem of evil (How can there be a just and all-powerful God when there is evil and tragedy?) and the contrasting biblical and scientific accounts of how the universe came to be.

Reich's (1993) research has demonstrated how individuals, with age and with development, resolve these apparent religious contradictions using RCR reasoning. Development is described in the following stages:

Stage One: Only one competing explanation is recognized.

Stage Two: One or more competing explanations are recognized.

Stage Three: Competing explanations are seen as needed for full understanding.

Stage Four: The relation between competing explanations is analyzed, and the situation specificity of the relative contributions of each is at least intimated.

Stage Five: An overarching theory or synopsis is constructed to specify the complex and mutual relationships between competing explanations, and the situation specificity of their explanatory weight.

So, for example, stage 5 responses to the biblical versus scientific explanations of the origins of the universe and humankind might emphasize God's setting in motion Darwinian evolution and/or the essentially moral-spiritual meaning explained in biblical accounts versus the essentially material-physical meaning explained in scientific accounts.

At the end of this focus on relational judgment and reasoning as they both define religious and spiritual development, we admit that they do not need to lead to reducing religious and spiritual development to general (e.g., Piagetian) stages of cognitive development. Furthermore, we see that adopting such a focus allows for precision in measuring and explaining.

STAGE-STRUCTURAL THEORIES: CONCERNS

Stage-structural theories of development in general and religious and spiritual development in particular have come under attack for several reasons. The main reasons have to do with (a) the linear and normative treatment of development, (b) the emphasis on cognition, judgment, and reasoning, (c) the emphasis on presumed universals to the exclusion of individual and cultural differences, and (d) the mostly positive/optimistic view of structural development that overlooks pathology among those at higher stages. A fair assessment of stage-structural theories must address these concerns—which we do in the next section on alternative approaches to religious and spiritual development.

Those who object to the linear and normative nature of stage-structural theories generally equate development with change over time. They may also place greater emphasis than do stage-structural theorists on the short-term functions that faith plays in individuals' lives. Together, these two ways of thinking about religiousness and spirituality lead us to note that stage-structural theories fail to capture the changes and consistencies in individuals' ways of being religious and/or spiritual (Wulff, 1993).

This criticism that stage-structural theories are too linear and normative may even be found as an implied criticism by the authors of stage-structural models. For example, Oser and Gmünder (1991), as well as Fowler (1981), report that using their stages to describe age changes reveals patterns that are decidedly nonlinear—especially among adults.

However, if the concept of development is distinguished from the concept of change over time, as we think it should be, then the linear nature of stage-structural models can be seen for its essential worth: for contributing to the *definition* of religious and spiritual development and for contributing to our ability to *evaluate* any given pattern of faith. A linear model is needed for the purposes of defining and evaluating, and age changes need not be linear for stage-structural models to be validated or useful (Kaplan, 1983b).

As for the criticism that stage-structural theories overemphasize the role of cognition, judgment, and reasoning in religious and spiritual development, several points apply. First, as we have seen, Goldman's (1964) theory and all other stage-structural theories that treat religious and spiritual development as being merely an application of universal cognitive structures do indeed go beyond the evidence to overemphasize the role of cognition.

However, overemphasis on cognition is not intrinsic to stage-structural theories. Indeed, Oser and Gmünder's (1991) theory as well as Fowler's (1981) include in their descriptions of stages many issues, conflicts, and concerns that are obviously social and emotional in nature. For example, both theories place at the center of religious and spiritual development, not the ability to think logically, but the ability to coordinate conflicts between individuation and making positive connections to God (the Ultimate) and to communities of diverse believers. Furthermore, and as Rest (1983) and Oser (1988) have argued, it is impossible to disentangle emotion from cognition because there is no such thing as reasoning without feeling. Finally, and following Piaget's lead, stage theorists such as Oser and Fowler assume that emotion provides a functional "motor" for the transition from one stage to another. Indeed, this seems to be particularly the case for transitions between the upper stages (Rollett & Kager, 1999).

The third concern and criticism has to do with stage-structural theories' emphasizing universals to the exclusion of cultural differences. As we see in the next section, the focus on nonuniversals and on cultural (communication) differences has become a main focus in recent times, often to the point of excluding discussion of universals.

However, the choice to focus on universals is a legitimate research focus. We need to focus on universals to adequately define human development. We also need to focus on those norms that need not be embodied but that form indispensable means for defining what development means, or should mean. Stage-structural theories do just that: By focusing on structural development rather than on content, we gain understanding of what we should mean by "developing" and whether any norms for defining development can be said to be universal. Furthermore, and as cross-cultural studies have shown, there is at least enough empirical research to suggest that, when it comes to religious and spiritual development, there are universals.

But does content not matter? This raises the last concern that stage-structural models are overly positive/optimistic. Our own view is that this concern is justified—despite the fact that there are discussions noting the potential for problems even at the higher stages (Kohlberg, 1981). However, the main point here is about content, not structure. Content matters, particularly

with respect to whether an individual's or group's images and beliefs support or undermine an ethical life. Individuals functioning at lower stages in stage-structural models may show more compassion and be more sensitive to issues of justice than many functioning at higher stages as defined by structural criteria only. Put another way, there are spiritual problems at all stages—as we discuss later in the final section dealing with problems of a religious and/or spiritual nature, such as the problem of religiously inspired terrorism. There is a need for research in this area, to document and explain the nature of problems at different stages of religious and spiritual development.

Having provided a stage-structural framework for thinking about religious and spiritual development, we can move on to evaluating current empirical approaches in the light of this framework. Because this framework has to do with norms for defining the maturing of faith and of persons, the discussion of current approaches is in terms of their not being about faith or persons, or about development defined by norms.

ALTERNATIVES TO STAGE-STRUCTURAL THEORIES

Is religious and spiritual development to be conceived of as a march toward a single, albeit complex and universal endpoint, thus following norms that push, pull, or define where individuals are to head if they are to develop? Or is religious and spiritual development to be conceived of as water flooding a hillside, as a branching bush, or as some other metaphor that characterizes development in terms of multiple pathways leading to multiple endpoints?

Development conceived of as an upward climb toward perfection is defined by approximations to perfection. Development conceived of as multidirectional pathways leading to multiple endpoints is defined by what happens to individuals as they react to unexpected moments and as they participate in particular contexts and cultures.

These two conceptions of development lead to quite different goals for the social scientist bent on explaining religious and spiritual development. Using a normative conception of development, explanation tends to be about the structural development that underlies or defines "lower" and "higher," "immature" and "mature," and about universals. Using a nonnormative conception of development, explanation tends to be closer to describing change over time, not only or mainly in the individual but also in the individual's transactions and participation in contexts and cultures to function and adapt.

We look at four quite different approaches that share a common understanding that religious and spiritual development need not and should not be thought of in terms of stages and universal endpoints. Each criticizes normative, stage-structural models for failing to explain the nonlinear changes that often occur in how religiousness and spirituality get expressed from birth to death. Each also criticizes stage-structural models for not capturing the diverse ways that individuals express themselves religiously and spiritually, for being overly optimistic about the fruits of structural development, and for putting western, liberal values above all others. David Wulff (1993) sums up these criticisms this way:

> The positing of religious development, especially in the form of progressive and irreversible stages, requires the assumption of religion-specific dispositions or structures as well as of particular end-states representing the fullest realization of the inborn potential. It is difficult to say, however, of what these rarely observed end-states consist. Furthermore, the construction of these states requires the imposition of certain philosophical and theological views, thus undermining any claims for universality. (p. 182)

We review the contributions of these current approaches to religious and spiritual development and their specific, as well as general, criticisms of normative, stage-structural theories, even if they are in part speculative. We begin with the contributions and criticisms of Susan Kwilecki's substantive-functional approach (Kwilecki, 1999), which follows in the tradition of religious studies.

Susan Kwilecki's Substantive-Functional Approach

Kwilecki's work is with adults, not children, because, in her view, "childhood is not the period of consummate religious expression." (1999, p. 264). She is, therefore, critical of current research on religious and spiritual development, which she says, "meticulously explains the differences in . . . the religious conceptualization of a 5- and a 9-year-old, but does not address the spectacular variety of adult religious perspectives"

(p. 264). Because of this variety, Kwilecki defines religious and spiritual development by quantitative measures. She writes,

> Growth or development in personal religion occurs . . . when ideas and experiences of the supernatural become increasingly salient and functional to the individual. . . . My criterion of religious development—the scope, depth, and pervasiveness of supernaturalism in life—is essentially quantitative. (pp. 32–33)

For Kwilecki, what grows or develops has to do with imagination more than with perception and reason:

> Becoming religious . . . means realizing, and increasingly acting upon the realization, that ultimately our fate lies with forces that transcend our generally most effective tools of adaptation—the senses and reason. Attempting to monitor critical but elusive powers, the religious are daily thrown upon the imagination, a faculty difficult to discipline and trust. Ongoing negotiations with unseen beings strain even the hominid capacity for symbolization. Not everyone becomes religious to the same degree. (p. 31)

As lives lived imaginatively, the religious, for Kwilecki, are not to be evaluated using the cognitive-developmental schemes derived from Piaget and Kohlberg.

With respect to defining religious and spiritual development, Kwilecki's (1999) work reminds us that the focus needs to be on whole persons functioning in complex and ever-changing circumstances. To capture religious and spiritual development, we cannot rely solely on general description systems such as those found in stage-structural theories. We need to know the details of individuals' lives, the challenges they face as well as their inner thoughts, fantasies, and feelings.

Kwilecki's (1999) work also shows us the value of certain forms of thinking and behaving that often are explicitly or implicitly denigrated by stage-structural theories. For example, in her case study of "Jack McCullers," a mechanic who reported he once received a divine command to purchase a head gasket for a Toyota, when he did not own a Toyota or know anybody who did. Kwilecki's response to the religious imaginings of McCullers was: "What could be sillier than thinking that the ruler of the universe would waste time on interventions and messages such as these? What could be lovelier than thinking that the ruler of the universe is so intimate and playful?" (personal communication; Kwilecki, September 2003). In short, in Kwilecki's approach, we see the inherent ambiguity in religious imagining that is often missing in normative, stage-structural approaches.

Kwilecki's (1999) approach corrects deficiencies found in normative, stage-structural approaches. But is her way of defining development entirely quantitative and without norms? In her writing, we can occasionally detect a normative and qualitative definition of development, one that seems sensible if not inevitable. Throughout her writing, Kwilecki goes back and forth between describing the ordinary individuals that are the focus of her case studies and extraordinary religious and spiritual exemplars. In her admiration of ordinary examples of faith but especially in her admiration of exemplars, one can detect an implicit developmental approach defined by qualitative differences. Whether writing about Mother Teresa, Black Elk, or the Zen nun Satori Myods, Kwilecki admires the faithful's ability to pursue noble purposes, especially in the face of adversity—and always she is taken with the faithful's ability to imagine realities beyond appearances, their ability to remain optimistic, and their ability to use imagination to adapt. Her person-centered approach can, therefore, lay the foundation for a normative developmental approach that is sensitive to culture, circumstances, and individual personalities.

Kwilecki's (1999) work focuses on adults because she believes that it is in the adult years that faith takes on its varied and sometimes magnificent forms. Her approach is nonnormative in the way she defines religious and spiritual development in quantitative terms, as faith gaining strength. Her approach gives us development without explicit norms, even if empirically not yet fully validated. The next example is of a current approach focusing on children because it claims that stage-structural models have overlooked children's rich and varied spiritual experience. The focus here is on assessing children's spirituality but without development.

The Spiritual Child Movement

In recent years, a number of psychologists and educators have been writing about "the spiritual child" (Coles, 1990; Hart, 2005; Hay & Nye, 1998; Reimer & Furrow, 2003), so many that we can discern a spiritual child movement that is, in part, a reaction to stage-structural theories of religious and spiritual development, which are generally seen as following along the lines set down by Goldman. As such, one of the main criticisms put forth by this group is that stage-structural theories are

too cognitive. For example, David Hay (Hay & Nye, 1998) writes:

> the cumulative feeling I am left with after reviewing what we know about childhood spirituality is an uneasiness about the adequacy of developmental theory (meaning stage-structural theories) to give an account of it. . . . The major problem (with stage theories) is their narrowness, coming near to dissolving religion into reason and therefore childhood spirituality into nothing more than a form of immaturity or inadequacy. (pp. 50, 51)

The idea that children are spiritual is not new. Throughout history, faith traditions have, at some time or another, found an innate spirituality in children—as demonstrated in the passage from Mark 10:15 (New Revised Standard Version), "Whosoever shall not receive the kingdom of God as a little child, he shall not enter therein"; in the reincarnation beliefs surrounding the search for a new Dalai Lama (Thurman, 1991); and in the treatment of babies by the Beng of Ivory Coast (Gottlieb, 2005). At various times, children have been seen as having a natural and uncritical faith, a natural wisdom and capacity for discerning the way things really are, and a spirituality that comes from being old souls. Therefore, what is new in the current spiritual child movement is not the idea of children being spiritual but the arguments attacking stage-structural theories for being too cognitive.

The spiritual child movement is a movement based on the idea that spirituality is rooted in personal experience, feeling, and biology. Those leading the movement do acknowledge there is a cognitive element to what they refer to as "spiritual experience." To experience spiritually requires at least the cognitive ability to step back and be aware—of the larger picture, of the mystery of life, of there being something more than what is given by the senses. But this ability is present at very young ages, as young as four by some accounts, but certainly by six.

The capacity for spiritual awareness is present at young ages because, says this group, humans have evolved in ways that provide for this capacity (Hart, 2005; Hay & Nye, 1998). Spiritual capacity is inherited capacity, a product of brain development. It is given to children by biology rather than by parents, teachers, or culture—though for spirituality to develop, children need lots of encouragement and support. In sum, the spiritual child movement is bent on getting across one main idea, namely, that children have the capacity for rich and varied spiritual experiences that form (or should form through being encouraged and supported) the foundation of their religious, ethical, and spiritual development.

What is the evidence supporting this claim that children have the capacity for experiences that are essentially spiritual? The evidence there is comes from interview studies of children, from retrospective paper and pencil studies of adults, and from collections of anecdotes.

Members of this group have been the first to point out that their methods and the available evidence do not meet rigorous scientific standards. Even with regard to the issue of how to define children's spirituality, they admit that it is difficult, at best, and perhaps impossible to pin down children's spirituality by means of definition. There is, says this group, an inevitable subjectivity to discerning children's spirituality. For example, Rebecca Nye (1999) writes that what she observed as moments when the children she interviewed were relating their spiritual experiences were moments not captured by the words appearing in transcripts. Those moments were singled out because, during them, children "seemed to shift into another gear" (Nye, 1999, p. 62) when speaking about their experiences.

Given the current evidence and methods, it might be easy to dismiss this movement on the grounds that it is not grounded in solid scientific research. However, doing so ignores the real phenomena being discussed. The main question is not whether the phenomena discussed are real but whether they warrant the designation of spiritual. Other terms work equally well, terms used by the leaders of this movement themselves—*wonder, awe, wisdom,* and *relational consciousness.* Adding the term *spiritual* runs the risk of adding a gratuitous interpretation.

Furthermore, by calling attention to children's "spiritual experiences," the group promoting the spiritual-child movement has self-consciously de-emphasized the role of judgment and reasoning and thinking in general, to the point of sometimes adopting an opposite extreme to that of Goldman. The previous quote by David Hay might serve as an example.

Finally, this group's approach may be questioned for how development is conceived (or not conceived, as the case may be). It is one thing to point out moments of awe, wonder, and wisdom in the lives of children and another to define faith and its development. Of the two enterprises, the second seems more significant. Moments of awe, wonder, wisdom, and relational consciousness are not likely to shoulder much of the work of establishing a foundation for religious and spiritual development.

At least, research has yet to show they do. And even if it is not the moments themselves that are important but rather the innate capacities they point to, we are still left with the question of how these innate capacities develop into mature patterns of faith. Granted that what develops has to do with wonder, awe, and wisdom, we are left still with the task of figuring out the qualitative differences between the wonder, awe, and wisdom of a child and that of, say, John Muir speaking of mountains as "God's cathedrals" (Cronon, 1997) and Gandhi demonstrating the wisdom of the Gujarati precept, "Return good for evil" (Gandhi, 1993).

In the following discussion of the next approach, we also find an appreciation for how much children understand—as well as an appreciation for the influence of elders and culture. However, unlike the previous two approaches, the next approach is grounded in experimental research done in post-Piagetian and postrationalist, cognitive-developmental psychology—with its focus on domain specific development and cultural diversity.

Cognitive-Cultural Theories

Stage-structural theories posit norms for defining development, which make them susceptible to being insensitive to cultural diversity. The wealth of information now obtained from new disciplines such as cognitive anthropology suggests that no stage-structural theory can do justice to the rich variety of thinking and acting that is found in and among cultures. Rather than adopt the stairway to maturity model, today's cognitive developmental psychologists, like Darwin before them, have adopted the model of an ever-branching bush.

Current cognitive-cultural theories (e.g., Johnson & Boyatzis, 2005) search for competencies specific to nonuniversal domains rather than search only for competencies that cut across domains (e.g., object permanence). This search has provided a more nuanced view of intellectual development. The word *domain* can have as its reference something quite broad, such as the domain of physics, or something quite narrow such as the domains of baseball and knock-knock jokes (Feldman, 1980). It is the broad sense of domain that is used in current cognitive studies—and three broad domains in particular have been the focus of research on children's cognitive development: the physical, biological, and psychological (theory of mind) domains. Throughout their early years, children are seen as developing intuitive knowledge in these three domains so that by age 4, most children have a fairly well developed intuitive ontology (Boyer & Walker, 2000; Harris, 2000).

This view of young children having a fairly well developed intuitive ontology directly contradicts the older Piagetian view, which characterizes young children's thinking as being prelogical. In this newer view, young children come off as neither rational nor irrational. Rather, they come off as adept at handling different systems of thinking about reality. For our purposes, two systems are central.

The first system is for thinking about everyday events. This is the default system. It rests on direct observation and on an innate push to find patterns and causal connections. It is not a system that looks for magic and the counterintuitive. On the contrary, it is a system that is thoroughly empirical. Preschoolers may pretend, but in doing so, they call their pretense "make-believe." And when not pretending, if their causal inferences seem irrational, it is more because they lack information and experience than because their thought processes are inherently irrational.

The other system is for thinking about the counterintuitive. It comes into play more because of culture and testimony of trusted caregivers than it does because of children's reflections on reality. Early on, children are exposed to counterintuitive ideas and counterintuitive worlds that make up their culture's religious heritage, and, remarkably, they have little difficulty taking on these ideas and worlds and making them their own (Harris, 2003).

They do so for a number of reasons. First, they trust their caregivers and mentors—those giving testimony to the reality of the counterintuitive (Harris, 2000). Second, because religious ideas are both counterintuitive and presented as true, children find them arresting and memorable (Atran & Norenzayan, 2005). Third, children are able to keep a kind of double booking—with intuitive ontology employed most of the time, and their newly acquired counterintuitive ontology employed when the occasion fits (Harris, 2003). Fourth, even when assimilating counterintuitive religious belief systems, children borrow from their intuitive ontology—making it possible to draw inferences from the counterintuitive world to the everyday and vice versa (Harris, 2000).

As can be seen in this account, the questions are about the development of distinctions and boundaries between separate domains. They are not questions about stages leading in a particular direction. Furthermore, children older than four are characterized as being much

more similar to adults in their basic thought patterns than Piagetian characterizations lead us to believe. Finally, culture, not simply organismic development, explains age changes in what children believe.

What does this mean for the study and understanding of religious and spiritual development? For one thing it means rejecting theologically influenced developmental models in favor of descriptions grounded in cross-cultural field research. For another thing, it means religious development is not a separate cognitive domain but rather a domain that draws on the cognitive achievements designed originally for mundane tasks. Finally, it means religious thinking is neither more primitive nor more mature than other kinds of thinking. It is simply different. And this relativity extends to distinctions between religious traditions themselves so long as individuals in any given tradition develop basic intuitive ontologies (physical, biological, psychological) and so long as the counterintuitive religious agents and worlds serve the usual adaptive functions of fostering moral (communal) commitment and relieving existential anxiety (Atran & Norenzayan, 2005).

This is a composite view of current thinking about religious development from a cognitive-cultural perspective. What are we to make of it? What are its strengths and weaknesses? The main strength in this perspective is providing a better account of how religious beliefs are acquired. The main weakness is the perspective's conflating belief and faith—so much so that, at times, the subject investigated seems to be something other than religious and spiritual development. For example, the perspective fails to distinguish differences between children's questions such as "Why don't angels fall down to earth?" (Harris, 2000), and adults' questions such as "Why do bad things happen to good people?" (Kushner, 1981). The first question lacks moral significance. The second question forces thinking about what kind of universe we live in and how we ought to face injustice and adversity. While there may be disagreement about whether both kinds of questions fall in the domain of religious and spiritual development, it seems clear that the second kind of question has more to do with what has previously been defined as faith.

Developmental Systems Theories

Developmental systems theories shift the focus from individuals to transactions between individuals and their various embedded contexts (Lerner et al., 2003). That is, developmental systems theories are essentially relational in nature. This means that development is located not in the person but in the ongoing transactions between the person and his or her multilayered contexts. Of concern here is the goodness of fit between person and environment. Religiousness and spirituality relate to the extent that they provide ways to foster a better fit. Indeed, one of the main findings coming out of research based on developmental systems theories is that religiousness and spirituality do indeed make it more likely for individuals to thrive because their behavior both improves and is rewarded by their contexts. In sum, thriving is the main interest; religious and spiritual development are of interest only as they lead to thriving.

Among the many types of studies linking religious and spiritual development to thriving are those investigating faith-based communities and their role in helping youth develop positively (Benson et al., 2003; King & Boyatzis, 2004; King & Furrow, 2004; Roehlkepartain, 1995). A study by Regnerus and Elder serves as the main example (Regnerus & Elder, 2003).

This study illustrates the developmental systems approach in several ways, first by its speaking about involvement in a faith based community as a potential "resilient pathway." The term *resilient pathway* reveals the approach's main assumption about plasticity as well as its main interest—what leads to thriving. The results of this study show that in high risk communities, church attendance functions as a protective mechanism "stimulating resilience in the lives of at-risk youth"—as shown by church attendance correlating positively with staying "on track" in school.

However, it is in Regnerus' and Elder's (2003) explanation of the results rather than in the results themselves that we see the main features of the developmental systems approach. Regnerus and Elder explain the results as follows:

> The ritual action of attending worship services or ceremonies, in contrast with theological differences that mark distinct religious affiliations and beliefs, appears to be a process that operates independently of particular belief systems and organizational affiliations. Church attendance may constitute—even if by accident—a form of social integration that has the consequence of reinforcing values conducive to educational achievement and goal setting . . . (In addition) . . . church attendance and doing well in school require commitment, diligence, and routine. The ritual practice of rising and going to church or mass, and so forth—whether compelled by one's own faith or

> one's parents' demands—commits a youth to a practice and routine, a skill that translates into tools needed for academic success. (p. 646)

In other words, for the study's at-risk youth, going to church regularly meant they were exposed to values and good routines that could be transferred to school.

Obviously, studies such as this study are much needed, especially for understanding how to support at-risk youth. But are they studies of religious and spiritual development, or are they simply studies of positive development defined broadly? We think they are the latter because they skirt the task of charting and explaining faith and its development. While these studies often acknowledge that faith is a unique and important variable, they do not explain how faith develops. And in not explaining how faith develops, they leave out the inner workings that define and explain the religious and spiritual development of persons.

In subsequent sections we return to discussing developmental systems theories and their contribution to understanding the positive correlates of religious and spiritual development. However, in the next section, we look more closely at the ongoing debate between stage-structural and cognitive-cultural theories—as we take up the task of explaining concept formation in religious and spiritual development.

CONCEPTUAL DEVELOPMENT IN RELIGIOUS AND SPIRITUAL DEVELOPMENT

Nowhere do we see the contrast between stage-structural and cognitive-cultural approaches more clearly than when characterizing conceptual development in religious and spiritual development. Stage-structural approaches provide the following composite picture:

- With age, children go from having mostly anthropomorphic and concrete conceptions of supernatural agencies to having mostly symbolic and abstract conceptions.
- With age, children go from reliance on magical and egocentric-imaginative reflecting, which includes thinking about supernatural agencies and prayer, to more rational and decentered thinking.

In contrast, cognitive-cultural approaches provide the following composite picture:

- With age, children, adolescents, and adults maintain conceptions of supernatural agencies that are both anthropomorphic and nonanthropomorphic.
- With age, children, adolescents, and adults develop intuitive ontologies having to do with what they can perceive directly, which coexist with counterintuitive ontologies having to do with what they cannot perceive directly. The acquisition of the latter constitutes neither magical-egocentric nor logical-decentered thinking.

What is the evidence supporting each of these approaches? And in looking at the evidence, can we find a way to reconcile the differences? To answer both questions we look next at studies carried out from each of these approaches—beginning first with studies carried out from a stage-structural approach. For the most part, we compare what the two sets of studies have to say about development with respect to concepts of (a) supernatural agencies, (b) religious institutions and prayer, and (c) death/life after death.

However, in discussing studies of religious concepts and their development, we remind readers that concepts can never be sorted neatly into *religious* and *nonreligious*. Certain concepts may not appear to be associated with religious or spiritual development. Nevertheless, by taking into account the context in which these concepts are experienced, they become religious or spiritual concepts. For example, at the surface level, the concepts of "work" and "family" may not appear to have religious or spiritual meaning. However, by placing these concepts in specific contexts their meaning becomes modified such that they take on a religious or spiritual meaning—as when Shakers speak of "consecrated labor" and Mormons speak of "the eternal family." Meaning is tied not only to development but also to culture and faith tradition.

Studies Carried Out from a Stage-Structural Approach

Studies of religious conceptual development carried out from a stage-structural approach have largely followed in the rationalist tradition exemplified in the work of Piaget. In this tradition, children's concepts reflect qualitatively different and less rational (when compared to adults' concepts) ways of thinking. This can be seen when examining a variety of religious concepts, the

most notable being those having to do with supernatural agencies, religious institutions, prayer, and death.

Supernatural Agencies

By far the most studied religious concept has been the concept God. Children's conceptions of God have been assessed in a variety of ways, most frequently by asking children to draw what they picture in their minds when they hear the word *God* . Having children draw pictures of God, write letters to God, and other relatively unstructured and projective methods have shown themselves useful for bringing out children's conceptions of God more readily than closed methods (Klepsch & Logie, 1982, p. 36; Tamminnen, 1991, p. 160).

These unstructured and projective methods are not without their problems. In particular, they encourage anthropomorphizing and, when used with children only, they can create biased comparisons based on children and adults being assessed differently (J. Barrett, 2001).

Methodological issues notwithstanding, numerous studies (Bucher, 1994; Hanisch, 1996; Heller, 1986; Nye & Carlson, 1984; Pitts, 1977; Pnevmatikos, 2002) have confirmed the trend described by Harms (1944). On the basis of more than 4800 drawings and conversations, Harms found that children, aged 3 to 6, produced predominantly fairy-tale figures of God, while older children portrayed God in an anthropomorphous manner. Only adolescents provided abstract-symbolic conceptions.

Since Harm's research, studies have repeatedly demonstrated that young children typically see God as a friendly, smiling old man, often with a beard, and often residing in heaven, with heaven depicted as a place somewhere above the earth (Bucher, 1994; Goldman, 1964; Heller, 1986; Tamminnen, 1991, p. 195). A number of surveys have shown that, with age, fewer and fewer children give anthropomorphous depictions of God, and more and more give symbols or metaphors to represent God—such as God being represented as light, nature, or love (Bucher, 1994; Goldman, 1964; Hanisch, 1996). Strict, or demonic images are rare (Frielingsdorf, 1992).

According to this set of studies, children's conceptions of God move from the anthropomorphic and concrete to the symbolic and abstract, albeit at different speeds in different religions. For example, Pitts (1977) found that Mormon children held on to anthropomorphous conceptions longer than average, while Jewish children did the opposite.

Do children's drawings reflect their *real* conceptions of God? The answer is not clear. Children may reproduce in their drawing schemes what can be canonized, schemes that may persist even though their inner conceptions have changed (Freeman, 1980).

However, anthropomorphizing in childhood cannot be attributed solely to the drawing method because, with respect to conceptions of God, other research methods have revealed a similar developmental trend. For example, in interview studies, a number of investigators have found that anthropomorphous depictions of the Divine dominate, more so than later on (Barnes, 1892; Vogel, 1936). Similarly, Thun (1959), who recorded the classroom conversations of German elementary schoolchildren during religious instruction, and Deconchy (1967), who classified French children's images of God by using a word association technique, found that children up to 11-years-old conceived of God anthropomorphously, while adolescents conceived of God in ways that were both abstract and vague. Hyde (1965), too, investigated adolescents' images of God with methods other than by using drawings and found a steady receding of anthropomorphisms, delayed in the case of children who regularly went to church.

In summary, numerous studies following in the stage-structural tradition have found that with age, children's conceptions of God become less anthropomorphic and less concrete and more symbolic and abstract. Similar results have been found in studies of children's conceptions of religious institutions and prayer.

Conceptions of Religious Institutions, Prayer, and Death

Religiousness and spirituality are not continually being invented anew. Rather, they are handed down by tradition in faith communities. Therefore, ideas possessed by children of religious institutions and practices are of particular interest not only to researchers but also to teachers of religion. The central studies remain those carried out by Elkind and his coworkers (1961, 1962, 1963), in which Jewish, Catholic, and Protestant children were asked how they perceived their denomination and religious community. The results supported the following description of age changes:

- Undifferentiated conceptions, according to which even a domestic cat could be regarded as Catholic (to age 7)

- Concretely differentiated conceptions (to age 9) in which religious affiliation was defined in terms of specific, concrete acts such as going to church or synagogue
- Abstractly differentiated conceptions (from age 10) that made reference to beliefs and ideology

As for prayer, given the diversity and universality of prayer, it is not surprising that the psychology of religion has, from its beginnings, investigated its development (Brown, 1994; Hyde, 1990). Early investigations derive from Pratt (1910), who characterized the development of prayer as leading from primitive and spontaneous supplication to more ritualized forms.

Goldman (1964) distinguished three stages in the development of the prayer concept. At the first stage, normally ending at age 9, children conceive of prayers like magic. Furthermore, younger children believe that God literally hears prayers and is compelled to accede to requests because the praying person has prayed properly and is a good person. Later on, children believe that the effect of prayer is dependent on its content; if prayers contain only material and selfish wishes, they will not likely be granted. In adolescence, development continues when prayer is seen as an expression of faith and as a form of psychic-spiritual self-help.

Rosenberg (1989) investigated age changes in several content areas of prayer: *How* (for instance, the physical position of the praying person), *What* (the content of prayer), *Whom* (the addressee of prayer or conception of God), and the reflective-subjective aspect of praying. Children and adolescents were shown pictures of people praying and asked to associate freely to what they saw. The results showed that, with age, the "how" became less significant. For younger children, externalities such as covering the head during prayer were important, and supplications as well as anthropomorphous conceptions of God dominated. For adolescents, prayer required a more psychological conception, such that they saw prayer's value as having to do with its effect on the praying person him- or herself.

Other studies have confirmed this trend of prayer developing from being a magical speech act to a spiritual dialogue. For example, Long, Elkind, and Spilka (1967) distinguished three stages of prayer. Children younger than nine regarded praying as essentially a way of asking for things. Beginning around age 9, the relevance of asking for things diminished, and prayer became an inner dialogue with God (Godin, 1968a; Thouless & Brown, 1964). Brown (1967) also found that belief in the magical-causative effect of prayer decreased with age.

In a study of prayer and its development in adolescence, Scarlett and Perriello (1991) had subjects provide prayers for hypothetical situations calling for prayer (e.g., praying for a dying friend). Their results showed that with age, adolescents prayed less for God to intervene directly to make dramatic changes, such as curing a sick friend, and more for God to provide support and guidance. Furthermore, with age, adolescents shifted from "talking at" God to "talking with" God such that they engaged more in sharing feelings, questions, and doubts and not just requests.

Together, these studies of age changes in how children and adolescents pray and think about prayer are reminiscent of William James' (1902) words about the development of prayer:

> the belief is, not that particular events are tempered more towardly to us by a superintending providence, as a reward for our reliance, but that by cultivating the continuous sense of our connections with the power that made things as they are, we are tempered more towardly for their reception. The outward face of nature need not alter, but the expressions of meaning in it alter. (p. 474)

Death, or rather the possibility of life after death, is perceived by many as a religious phenomenon, which means that children's and young people's conceptions of death should be taken into account (see reviews by Faulkner, 1993; Ramachers, 1994; Wittkowski, 1990). Early on, Anthony (1940) questioned 128 children about their definitions of death and found that, with age, children only gradually come to realize that death refers to the cessation of life functions and is biologically necessary. Numerous studies since then have demonstrated that children between ages 3 and 5 do not understand death to be universal (mostly old people die, but not one's parents), nor do they consider death to be irreversible. By age 7, children normally develop at least a nascent understanding of the irreversibility and universality of death so that most children, by age 9, possess a developed conception of death (Wittkowski, 1990, p. 58).

Relatively little has been written about how the concept of life after death changes over time (Tamminnen, 1991, p. 262). Barth (1911), in a survey of German children, showed that children conceived of heaven as a specific locality somewhere above the earth. Burgardsmeier (1951) found, in a survey of German children of compulsory school age, that children conceived of heaven as a fantastic, beautiful, and sacred place and

then as air, firmament, and the residence of God, and, finally, as a symbol. Blum (cited in Ratcliff, 1985) found that children's conceptions of life after death became vaguer with increasing age, and that age accounted for more of the variance than did religious background. These results were replicated by Tamminnen (1991, p. 260–278), who found that young schoolchildren depicted eternal life and heaven with above average graphic detail (p. 278). Older children had difficulties locating heaven in the cosmos, or else provided theologically inspired ideas (e.g., "Heaven is within us.").

Once again, studies carried out following a stage-structural approach accentuate differences between children's, adolescents', and adults' religious concepts as well as accentuate the usefulness of using the anthropomorphic to nonanthropomorphic and concrete-literal to abstract-symbolic criteria for describing and evaluating religious and spiritual development. The same is not the case with studies carried out following a cognitive-cultural approach—as the subsequent discussion explains.

Studies Carried Out from a Cognitive-Cultural Approach

The previous section provided an overview of the cognitive-cultural viewpoint or approach. Here, we look more closely at the evidence and arguments supporting this viewpoint and its characterization of conceptual development in religious and spiritual development. We begin with evidence and arguments related to concepts of supernatural agencies.

Two questions have framed studies carried out from the cognitive-cultural approach. The first is, "Are children mostly anthropomorphic in their thinking about supernatural agencies, such as God—as stage-structural theories lead us to believe?" The second is, "Are children's concepts of supernatural agencies essentially different from adults' concepts of supernatural agencies—as stage-structural theories lead us to believe?"

The first question has been addressed by asking children what they know about ordinary agents such as humans. The starting point for discussion is Wimmer and Perner's (1983) study showing that children as young as 5 understand that others' thinking may differ from their own depending on what information others have available to them. For example, a 5-year-old discovering rocks in a cereal box will correctly predict that an adult encountering the box for the first time will think there is only cereal in it, not rocks. Therefore, even young children have a theory of mind.

However, when asked whether God will make the same mistake, children, by age 5, say, "No." Even young children understand that God is no ordinary agent—that God has supernatural, counterintuitive powers. In short, with respect to the concept of God, children are not as anthropomorphic as previously pictured. Rather, children make a clear distinction between persons and God. The same holds true for children raised in cultures and faith traditions with supernatural, religious agents other than God—such as Krishna and ancestors.

The second question, about differences between children's and adults' conceptions of God, has led to studies that show adults, as well as children, conceive of God anthropomorphously. J. Barrett and Keil's (1996) study is the one most cited. Barrett and Keil found that their adult subjects, when asked directly about God's nature, gave theologically correct answers, answers that avoided defining God anthropomorphously. However, when asked to recount stories involving God, the same adults added to or distorted the stories by anthropomorphizing God—such as speaking of God as "not noticing" or as acting sequentially. They spoke of God as acting in very human ways. Barrett and Keil concluded that adults, like children, develop and maintain conceptions of God that combine their counterintuitive understanding of God as a supernatural agent with their intuitive understanding of how normal agents act. This same combining of the intuitive and counterintuitive applies to other religious supernatural agencies as well (spirits and ancestors).

With respect to prayer, Woolley's research provides a similar finding to that of Barrett and Keil (1996). Woolley (2000) asked children, ages 3 to 8, to teach a puppet to pray. She also interviewed the children about their understanding of prayer, its effects, and why prayers sometimes do not get answered. Her results share certain findings with studies carried out from a stage-structural approach. However, there were important differences stemming from her comparing children's understanding of prayer and their intuitive knowledge of causation.

First, Woolley (2000) showed that children as young as age 5 develop a mentalistic conception of prayer—much earlier than that reported by Long et al., 1967. Second, she showed that, by age 5, children begin to give up belief in the causal powers of wishing, even as they begin

to believe in the causal powers of prayer. Therefore, children's belief in the efficacy of prayer cannot be attributed to their holding magical views of the causal powers of thinking in general and wishing in particular. Their believing in prayer's efficacy is, rather, a result of their being taught or socialized. Woolley's participants came from religious families. Furthermore, their belief in the efficacy of prayers but not in the efficacy of wishes seemed to be tied to their understanding that prayer, unlike wishing, involves an intermediary, God, who is a supernatural agent.

With respect to children's conceptions of death and life after death, the same cognitive-cultural framework applies. In the course of direct experience with death, children construct their own, intuitive ontology about death such that they understand death's irreversibility and inevitability at much younger ages than stage-structural theories lead us to believe (Slaughter, Jaakola, & Carey, 1999). However, in the course of experiencing death, children also acquire counterintuitive beliefs about death and life after death—beliefs transmitted by culture and faith tradition through the testimonies of trusted others (Harris, 2000).

Together, these cognitive-cultural accounts of children's religious concepts leave us with a quite different picture of children's capacities and of culture's role in religious and spiritual development. Whereas some researchers see children as having limited capacity and culture being responsible for helping children overcome their natural propensity for magical thinking, others conceive them as having considerable capacity and culture being responsible for teaching or communicating beliefs about what is counterintuitive. Therefore, at the center of the newer picture is the distinction between intuitive and counterintuitive ontology.

However, because there is much that is counterintuitive that is not learned in childhood, for example, the Darwinian concept of evolution, why are religious counterintuitive concepts learned much earlier? Harris (2000) provides a compelling answer. Counterintuitive religious concepts, such as the concepts of gods, spirits, and ancestors as supernatural agencies, do not require children to give up their intuitive, commonsense concepts of ordinary agents. In contrast, scientific concepts, such as the Darwinian concept of evolution, do indeed require children to give up their intuitive, commonsense concepts. One cannot, for example, hold both the intuitive, creationist view that species are immutable and the counterintuitive, Darwinian view that states the opposite. In contrast to counterintuitive scientific concepts, counterintuitive religious concepts operate in parallel to intuitive, nonreligious beliefs—at least for most people, most of the time.

A Synthesis

Where do these contrasting pictures leave us with respect to our present understanding and future research? One possibility is that they force us to reject one in favor of the other. However, this possibility seems a poor choice. On the one hand, the cumulative results of numerous studies suggests that there are indeed important differences in the way children as compared to adolescents and adults give meaning to religious concepts. These differences are not simply the result of faulty research methods and unevenness with respect to socialization. On the other hand, the results of careful and thoughtful studies comparing intuitive and counterintuitive ontologies demonstrate important similarities in the way children, adolescents, and adults provide meaning to religious concepts.

We suggest that these two approaches are not so opposite as they first appear to be, and that a synthesis is possible. Focusing on differences does not exclude focusing on similarities. Furthermore, these two foci complement rather than contradict one another. The strength of the cognitive-cultural approach lies in its providing better explanations for how religious *beliefs* are acquired. The strength of the more normative, stage-structural approach lies in its providing possibilities for explaining how religious beliefs become existentially relevant or, as Johnson and Boyatzis (2005) said, how religious concepts help with the task of connecting the self with a more valued reality. Put another way, the stage-structural approach may be more useful with respect to explaining how beliefs become integrated with feelings and actions to form a pattern of faith that can lead individuals to function at higher religious or spiritual levels. After all, religious and spiritual exemplars are exemplary largely because of their positive and powerful faith and not because of their concepts and beliefs.

RELIGIOUS AND SPIRITUAL DEVELOPMENT IN CONTEXT

Religious and spiritual development always takes place in multiple and layered contexts. Furthermore, each

context has in itself parts operating together to form systems—with the various systems themselves operating together to form larger systems. This observation about contexts makes any attempt at causal explanation complex indeed—for clearly, in any final analysis, cause is to be found in the combination of a seemingly infinite number of causes (Lerner, 2002).

In the following discussion, when we speak of a particular cause, influence, outcome, or dependent variable, we do so with a developmental systems paradigm still in mind. We use these concepts for what they are—still useful concepts for exploring how religiosity and spirituality develop, even if they are not useful for fitting religiousness and spirituality into some procrustean bed. They are useful, too, given the fact that our methodologies lag behind progress in theorizing.

Now, we look at three main contexts for thinking about what influences or supports religious and spiritual development. These three are the family, the religious school, and the congregation. We focus on these three because of their logical connection to religious and spiritual development but also because they have been contexts that have been studied empirically.

The Family Context

As several have noted, the family is the most powerful influence on children's religious and spiritual development (Boyatzis, Dollahite, & Marks, 2005). Its influence is twofold. First, as an institution of socialization, the family directly impacts the developing child. This occurs when practices, beliefs, traditions, and values are transmitted from parent to child. Second, children are indirectly influenced in their religious and spiritual development by the attachments they form in their family. The Divine can function as an object of attachment, and the attachment a child forms with the Divine can occur either as a way to continue having a secure attachment or as a means of compensating for an insecure attachment. In sum, parents and families influence the religious and spiritual development of their children in direct and targeted ways, especially through religious teachings and practices, but also in indirect and untargeted ways, especially through the way they foster attachments.

Socialization and Practice

Empirical research has repeatedly demonstrated that with regard to religious development, mothers and fathers have the most influence (Beit-Hallahmi & Argyle, 1997; Hood et al., 1996). For example, Ozorak (1989) found parents' influence on their children's religious development to be much greater than that of peers, as well as more lasting than parents' influence on their children's political development and ways of structuring leisure time. And, as indicated in Table 17.5, Cavalli-Sforza (1982) found correlations that are consistent with the findings and interpretations of these other studies.

Similar results have come from self-report studies of young adults. For example, the young adult interviewees in B. Hunsberger & Brown's (1984) study reported that the strongest influence on their religious and spiritual development was their mother, followed by the church and their father, with friends and the media playing only a modest role. B. Hunsberger (1995) also found that older subjects considered their religious development to have been most influenced by their mothers, followed by their fathers and the church, and then by the media, friends, and school.

In a number of studies, mothers are credited with having the primary influence on children's religious and spiritual development (Boyatzis et al., 2005). Several reasons seem to apply. First, mothers maintain a higher profile in matters of religious practices such as church attendance and family prayer (Beit-Hallahmi & Argyle, 1997). Also, mothers are more likely than fathers to converse with their children about religion. For example, Strommen and Hardell (2000), in a study of mainline protestant youth, found that mothers had conversations with their children about faith and life issues nearly two-and-a-half times more frequently than did fathers. Finally, mothers are most often the ones who introduce children to religious practices, for example, by leading them in family prayer and taking them to religious services (Hood et al., 1996).

One of the most interesting findings has to do with the extent to which parents influence their children's religious *practices* as compared to their religious *beliefs.* There are stronger correlations between the religious *practices* of parents and those of their children than there are between the religious *beliefs* of parents and those of their children. Gibson (Gibson, 1990) found that parents' church attendance correlated with that of

TABLE 17.5 Parental and Peer Influence Compared

	Parent-Child	Friend-Child
Religious behavior	.57	.20
Political behavior	.32	.16
Entertainment	.16	.10
Sports played	.13	.16

their young adult offspring more powerfully ($r = .60$) than with their attitudes toward Christian beliefs ($r = .50$). Similarly, Ozorak (1989) found that family cohesion influenced children's religious practices but not their beliefs. Beliefs, it seems, become increasingly individual as children grow older. Furthermore, a more powerfully individualized faith is accompanied by higher intellectual aptitude.

In the family, the available research suggests that religious development is furthered by a number of factors, including a climate of support characterized by encouragement to have independent views, encouragement to engage in discussion, and closeness between parents and children. For example, closeness between parents and their children predicts higher positive correlations between the religiousness of parents and the religiousness of their children. This still is the case when children become adolescents (Erickson, 1992).

In two parent families, support also depends on whether parents share the same religious convictions with each other. When parents share the same religious convictions, they influence the religiousness of their children more powerfully than when they hold opposing convictions (Hoge & Petrillo, 1982). Parents holding opposing convictions are associated with their offspring's religious apostasy (Caplovitz & Sherrow, 1977).

The phenomenon of giving up one's religious origins (apostasy) has been the subject of a number of studies (Caplovitz & Sherrow, 1977; Hood et al., 1996). Caplovitz and Sherrow (1977) identified familial strain and dissociation from parents as the main psychological antecedents of apostasy. L. Hunsberger (1980), too, found that the antecedents of apostasy included poor relations with parents. In addition, B. Hunsberger and Brown (1984) found that apostates reported considerably less emphasis on religion in their childhood home as compared to matched controls who remained faithful to their original religion. Thus, apostasy is not so much the result of an excess of religious teaching as it is a result of too little of it. In sum, apostasy can result from not enough religious encouragement—which follows from Niggli's (1988) study that demonstrated that religious encouragement has indeed a significant effect on religious development.

Niggli also developed scales to measure style of religious instruction and their effects on religious development: in particular, the styles of *religious compulsion* and *religious encouragement.* In Niggli's study, young people who reported greater religious encouragement by their parents (e.g., "When I had ideas of my own in matters of religion, my mother/father took me seriously.") were significantly higher on the stage scale of religious judgment (Oser & Gmünder, 1991) than were young people with little or no religious encouragement.

However, influence goes both ways, and children's developmental level is a determining factor in their attitudes toward religion and in the religious climate of the family as a whole. For example, in a random sample of Swiss parents and children, Klaghofer and Oser (1987) found that children evaluated as being at stage 2 on the Oser and Gmünder (1991) scale had a more positive family climate than did children evaluated as being at stage 3. This finding was expected, since persons at stage 3 attribute a lower status to religiousness than do persons at stages 4 and 2.

Similarly, recent research has emphasized the positive role played by conversational dialogues between parents and children on children's religious and spiritual development. In a study of diary entries recording conversations between parents and children, Boyatzis and Janicki (2003) found that children play an active role in initiating, terminating, and driving religious conversations. Furthermore, they found that parents tended to ask questions that were open-ended, and the questions themselves were devoid of suggestions revealing parents' personal views. In another study, of young Jewish adults, Herzbrun (1993) found that the frequency of religious discussion in the family had an enduring influence on young people, especially on girls.

In sum, the collective picture painted of religious socialization in the family supports a constructivist perspective and reveals a reciprocity process such that parents and children are influenced by what the other has to say (Boyatzis, Dollahite, & Marks, 2005). Through conversations with parents, children are afforded the opportunity to puzzle over religious and spiritual matters and to construct their own personal views. Further, the transmission of religious views from parent to child happens not as a result of didactic teaching so much as it happens as a result of parent and child co-constructing their spiritual identities. Therefore, children's participation in their own religious development supports rather than undermines continuity between generations.

There is sufficient evidence to show the deep extent to which the family influences religious development, particularly by the type of religiousness or religious instruction practiced in the family. Most people remain in

the denomination in which they are born and in which they grow up. Even in cases when young people turn to radical forms of religion, there are usually continuities with their parents' religion. An example is the Jesus-people movement, which made such a stir in the 1970s. Most of the followers came from fundamentalist Christian families. Although these young people were rebelling against their parents, they had internalized their parents' religious attitudes and were living them out, albeit in a radicalized form (Richardson, Stewart, & Simmonds, 1979).

Religious development is also influenced by parenting *style*. The available research suggests that parental emphasis on obedience encourages a religious attitude according to which human nature is corrupt, sin is to be punished, and the Bible must be interpreted literally (Ellison & Sherkat, 1993). At the beginning of the 1960s, 66% of the children interviewed by Nunn (1964) reported that their parents threatened that God could punish them, and although this happened much more frequently in socially disadvantaged families, it also took place when parents felt themselves to be powerless and in need of a coalition with a strong and vengeful God. Similarly, Potvin and Sloane (1985) found that adolescents whose parents exercised powerful control and constraint were more likely to perceive God as punishing deviant behavior.

Attachment

Images of God become even more relevant in research about attachment. The influence of parents on the religious and spiritual development of their children is not limited to the direct way in which they teach, encourage, and transmit faith traditions. There is a second, more subtle, type in which parents influence their children's spiritual development indirectly, through the ways they interact with their children and determine the quality of their attachments.

Ana-Maria Rizzuto (1979) made an important contribution in studying this indirect influence. Through the use of her God and family questionnaires, Rizzuto demonstrated how individuals' images of God can be strongly related to their images of their relations to their parents.

Since Rizzuto's work, research on parents' indirect influence has continued outside the framework of psychoanalytic theory. Most of this research has been conducted using the constructs of attachment theory, looking at how early attachment patterns between parent and child affect the relationship between person and God in later life. As noted by Granqvist (1998) and Kirkpatrick (1995), God functions as an attachment figure because many believers imagine God as a safe haven and secure base who maintains proximity and is strong in times of distress—all requirements for being an attachment figure.

Most of the attachment research on religious and spiritual development has made use of the Ainsworth (e.g., Ainsworth, 1978) typology—to test for two possibilities. The first is that persons who, early on, developed a secure attachment pattern with a caregiver tend to image a close and always protective God. This possibility is commonly referred to as the *correspondence thesis*. According to the correspondence thesis, a secure attachment attained during early childhood prepares an individual to adopt a corresponding secure attachment with God later on.

The second possibility is that persons who, in early childhood, developed an insecure attachment pattern (ambivalent or avoidant), tend to image God as a guarantor of protection and security. This possibility is commonly referred to as the *compensation thesis*. According to the compensation thesis, God becomes a surrogate attachment figure who compensates for the absence of an internalized secure attachment from childhood.

In a survey of 213 adults, Kirkpatrick and Shaver (1990) found evidence for the compensation thesis. They classified subjects according to the different attachment types, and compared subjects' images of God, also taking into account subjects' status with regard to extrinsic and intrinsic religiousness. Subjects assigned to the avoidant attachment type were clearly the most religious. They scored highest on the loving God and intrinsic scales, on attendance at service, and on reporting a personal relationship with God. This was especially the case for those reporting only infrequent religious practice in their parents' home (Kirkpatrick & Shaver, 1990, p. 325). Furthermore, half of the avoidant group reported having experienced a sudden conversion, whereas in the two other groups this happened to only one person in nine. The differences between the securely attached and the ambivalently attached were markedly lower.

In a later study, Kirkpatrick (1997) reproduced the results of this first study using longitudinal data. Women were first interviewed to determine their attachment status, then, 4 years later, interviewed again about changes in their religiousness. During the second interviews, 40%

of the women who had previously reported experiencing an avoidant attachment relationship with a parent, reported that, since the first interview, they had found a "new relationship with God." The percentage for those who had reported having a secure attachment relationship was significantly lower.

Grangvist (1998) also tested the compensation thesis. In a study of 203 Swedish students, he collected information about the attachment behavior of mothers *and* fathers and about the remembered religiousness of both parents. Combining ambivalent and avoidant groups into one, insecurely attached group, Grangvist found that the insecurely attached group scored higher on religiousness, on relationship with God, and on theism—but only when parents were reported to be not very religious. However, among subjects remembering their fathers as being highly religious, the securely attached expressed greater religiousness and a closer relationship with God: Under these conditions, the correspondence thesis applied.

The correspondence thesis is further supported by a comparison of deity figures in cultures possessing clear differences in the behavior of parents. For example, Lambert, Triandis, and Wolf (1959) demonstrated that in child-centered societies, where children are surrounded by loving care, God and deity figures tend to be benevolent beings, but in cultures with rejecting parenting styles, God and other deity figures tend to be malevolent.

From these results, it becomes clear that the connections between attachment experiences in early childhood and religiousness later on are complicated and not straightforward. Religiousness can function not only in a compensatory manner but also as an extension of the young child's relationships with his or her parents. However, the patterns are not random. They simply derive from more than one combination of antecedent conditions.

Religious Schools and Religious Education

Most of the research on religious schools has been on Christian, denominational sponsored schools in the United States, Europe, and Australia. The main research questions have been about religious schools' influence on pupils' religious beliefs and practices. Differences between school systems and student populations make comparisons difficult (e.g., Hyde, 1990). However, the composite picture drawn indicates that religious schools do not influence religious development and attitudes in any powerful way (Hood et al., 1996).

Francis (1987a) questioned almost 5,000 young persons attending Catholic private schools in England, and found that these schools had very little influence on students' attitudes toward Christian beliefs. A more decisive factor was the influence of the parental home. When the parental home follows the same religious educational choices as the denominational schools, the school's effect with regard to faith and later church practice is greater. Spencer (1971) concluded that in the absence of reinforcement from the family, there is no reason to expect that the religious school will modify values and value-oriented behavior.

With regard to religious development, it seems that religious schools possess not so much a compensatory or independent function as a supplementary one, to the extent that they have any effect at all. The same conclusion was reached in studies carried out on the effect of religious schools in Australia (Hyde, 1990). Anderson (Andersen, 1988) found that the choice of a Catholic private school depended to a large extent on the religious and philosophical attitudes of parents, especially mothers; the schools themselves changed the attitudes and practices of the pupils only marginally.

As for explicit religious instruction in public schools, practices differ depending on national policies. In France, there is no teaching of religion at all in state schools, but in the United Kingdom, religious education is taught under the auspices of the government; in Germany, religious education is taught by and under the auspices of the Church but financed by the government.

With respect to the content of religious education, opinions are divided about what constitutes religious knowledge and the goals of religious education. The spectrum of expectations ranges from the imparting of general religious knowledge to the considerably more ambitious aim of kindling faith and motivating religious practice and church attendance.

The relatively few studies on the effects of religious education are in agreement that its popularity decreases markedly as children get older, especially in adolescence. On the basis of questioning more than 800 schoolchildren in England, Francis (1987b), showed that religious education is the second most popular subject among children in first grade (junior year 1 in the United Kingdom)—only sports ("games") is more popular, but by the time students are in ninth grade (secondary year 4 in the United Kingdom), it is the least

popular subject. A study of 7,000 schoolchildren carried out in Germany on the popularity and perceived efficacy of religious education yielded similar results. The popularity of religious education is high in elementary school, but in the 2nd year of high school it falls to the lowest third, with only physics and Latin being less popular (Bucher, 2000).

With increasing age there is also a marked diminishing of the effects attributed to religious education; these effects are highest in the area of general knowledge, including knowledge of other religions, but the effects are small in matters of church practice and devotion.

How can we account for such a significant drop in popularity and influence of religious education? A first possible explanation is that religious education loses its popularity because the popularity of the school as a whole decreases with age. However, this explanation does not explain why the acceptance of other school subjects (e.g., mathematics and English) remains constant.

A second possible explanation is provided by Oser and Gmünder's theory (Oser & Gmünder, 1991): Convinced that God is able to intervene in the world and that He can be influenced through prayers—indications of stage 2—schoolchildren are considerably better disposed toward religious education and toward considering religious education to be more relevant than are adolescents, whose religious judgment is apt to be at stage 3 (Bucher, 2000, p. 128). At stage 2, children find it important to conform to God's expectations, more so than later on in adolescence when they have developed to stage 3, the deistic stage, in which self-determination is central.

However, whether religious education continues to influence may depend on the character or methods of that education. For example, in a quasi-experimental intervention study, in which two experimental groups discussed religious dilemmas over a long period of time, Oser and Gmünder (1996) found the average judgment stage rose more significantly than did the average for a control group lacking in opportunities to discuss and problem solve collectively. Moreover, this difference remained constant in a follow-up survey carried out 6 months later. A similar result was produced by Caldwell and Berkowitz (1987) who had high school students aged between 15 and 18 discuss religious dilemmas over a period of 12 lessons. A subsequent test revealed that for more than half of the students discussion sessions lead to significant development with respect to stages of religious judgment.

It is possible to use targeted teaching strategies as a means of significantly modifying religious development in positive ways, however, to do so requires engaging students in religious discussion to encourage them to question and modify their earlier religious interpretative patterns.

Congregations

Outside of the family, few contexts have a greater potential for influencing and supporting religious and spiritual development than do congregations. Congregations play a potentially important role in shaping religious beliefs as they, "provide spiritual environments where young people can transcend their everyday concerns and experience connectedness with the divine and human others. . . . Congregations may provide a distinct context in which a young person can explore (spiritual) issues that are critical to commitment to identity" (King, 2003, p. 200). Furthermore, congregations connect youth to their community because they exist not on their own but rather as a subcommunity in some broader community (Roehlkepartain, 2005).

Given this potential, it is surprising that there is so little empirical research on their influence on religious and spiritual development. Congregations have, as Roehlkepartain notes, slipped through the cracks in the divide between psychology's focus on individuals and sociology's focus on institutions (Roehlkepartain, 2005).

Congregational influence on the individual is bidirectional: The congregation shapes individual members, and individuals in the congregation shape the congregation's goals, climate, and activities.

Roehlkepartain (2005) outlines the conditions and processes that are presumed to play a role in driving spiritual development. First, congregations provide opportunities for the formation of meaningful, positive relationships. Youths are able to forge relationships with adults and peers who are invested in them and those relationships become the forum for the transmission and construction of beliefs and values. Second, congregations establish a climate for supporting spiritual development. Presumably, congregations that are welcoming and warm and that are encouraging of thought and service are more likely to promote spiritual development and faith maturity than those that do not.

However, there seems to be a gap between congregations' actual influence and their potential for influence (e.g., Osmer & Schweitzer, 2003; Prell, 1995;

Roehlkepartain, 2005, Yust, 2003). The National Congregational Life Survey (Woolever & Bruce, 2004) found that 50% or fewer of the surveyed congregations (n = 2,000) had effective caring for children and youth, and that a majority was reported to have fewer than 5 of the 10 strengths researchers examined. Based on these results, it appears that too few young people are spending time in congregations that are vibrant, spiritually enriching, communities of faith (Roehlkepartain, 2005).

However, these results are somewhat offset by the more positive reports from young members of congregations themselves. For example, C. Smith (2003) reported that 62% of teenagers surveyed in one study said congregations helped them think about important matters, 75% said their congregation was both warm and welcoming to teenagers, and 82% said that their congregation regularly provided opportunities for leadership and service.

Therefore, congregations present an interesting paradox. They have tremendous potential for shaping and guiding spiritual and religious development. However, they have not been the focus of a great deal of empirical research, and what research there is suggests that we are a long way from determining any actual influence. Furthermore, the existing body of data on congregations is largely from samples that are both Christian and North American—and there is no scientific reason for assuming that results from these samples can be generalized elsewhere.

POSITIVE CORRELATES OF RELIGIOUS AND SPIRITUAL DEVELOPMENT

What effects do religiousness and spirituality have on individuals' health and sense of well-being? Does religiousness produce neurotic behavior, as Freud (1961) asserted, or does it increase the morality of believers, as is generally assumed (Walker & Pitts, 1998)? Does spirituality, especially at higher stages of development, expand social consciousness and capacity to cope? In this section, we examine how religiousness and spirituality relate to the following:

- Health and well-being
- Moral development and social conscience
- Coping
- Adjusting to old age

Health and Well-Being

A good number of studies have addressed the effects of religiosity and spirituality on health and physical and psychological well-being. Plante and Sherman (2001) refer to at least 350 studies on physical health and 850 studies on mental health that treat religiosity as an independent variable. The majority of these studies show that religious involvement and spirituality are associated with better health outcomes. Even when excluding those studies with serious methodological flaws, the evidence suggests that religiosity and spirituality have significant and positive effects on health and on expanding the life span. Those who regularly frequent religious meetings have a 30% reduced risk on mortality. This effect remains highly significant even after controlling for demographic and socioeconomic variables. Furthermore, persons who regularly attend religious services live longer (Oman, Kurata, Strawbridge, & Cohen, 2002).

Undoubtedly, these positive correlations relate to religion's promoting not simply participation at religious services but also a healthy lifestyle. As measured by participation and attendance at religious services, religious persons practice fewer health risk behaviors such as smoking, drinking, and sexual promiscuity.

Powell, Shababi, and Thoresen (2003) demonstrated this connection between religiosity and healthy lifestyle with specific regard for cardiovascular disease and cancer. Their findings suggest that the social support provided by religious communities can reduce distress and feelings of loneliness, both of which can undermine physical health. A similar finding has been found with respect to religious support and drugs and alcohol—with religion serving to help addicts avoid or turn away from drugs and alcohol (Blakeney, Blakeney, & Reich, 2005).

Meditation has long been a religious and spiritual practice for promoting health and well-being. Most religious traditions have developed meditative practices, in part, for this reason. The effects of meditation are one of the best investigated subjects in the psychology of religion (Andresen, 2002) and the majority of studies report positive effects. Meditative practices, such as Transcendental Meditation and yoga, lower systolic and diastolic blood pressure, increase nonrenal blood flow, and decrease respiratory and heart rate (Andresen, 2002). These physiological effects reduce anxiety, depression, and stress (Austin, 1997). The long-term practice of meditation produces more intense experiences of joy, meaning, love, and awareness (Andresen, 2002).

With regard to mental disorders and religious and spiritual development, probably the single most consistent finding has been that there is a negative correlation between substance-related disorders and religiosity, especially when religiosity is measured by involvement in a faith-based community. Put another way, all other things being equal, religious and spiritual development appears to be a significant protective factor preventing an individual from developing a substance-related disorder (Benson, 1992).

The quality or character of religiousness also affects health, not just whether an individual is involved in a religious community. Intrinsic religiousness has stronger and more positive effects on physical and mental health than extrinsic religiousness (Argyle, 2000). Batson, Schoenrade, and Ventis (1993) analyzed 115 studies and found that most studies reported that intrinsic religiosity correlated positively with health, especially mental health, but extrinsic religiosity correlated more negatively (see also Plante & Bovccaccini, 1997). Furthermore, intrinsic religiosity positively correlated with a sense of coherence, which itself enhances mental and physical well-being. In addition, individuals practicing intrinsic religiosity are, on average, happier, especially if they feel close to God (Pollner, 1989).

In sum, religiosity can positively influence physical and mental health and well-being and happiness. Argyle (1999, p. 366) discussed these findings as, in part, due to the effect of the social support provided by the religious communities.

Moral Development

In the history of social science research, religion has been depicted as serving only a weak influence on morality, or none at all. This view has been supported in several well-known studies. For example, Hartshorne and May (1928) showed that neither religious affiliation nor religiously directed character education had any effects on moral behavior. Darley and Batson (1973) found that almost two-thirds of the undergraduates they observed entering a chapel to hear a sermon on the Good Samaritan, failed to help a man lying on the sidewalk and in need of help. And in the current debate over character education, there often is a determined effort to keep religion out of the discussion (Damon, 2002; Schwartz, 2002). However, by far the most important support for this view of religion's relationship with morality being separate has been the research and legacy of Lawrence Kohlberg.

Moral Judgment

For more than 2 decades, Lawrence Kohlberg (1981) labored to have moral development considered as a separate, autonomous domain—with the main engine of moral development being those mundane conflicts that confront children and adolescents daily. In doing so, Kohlberg argued against divine command theory and all those who believe that morality derives from the prescriptions of religion. For most of Kohlberg's career, moral development was independent of religious and spiritual development. If anything, religion had, for him, a potential stultifying effect because of those times when religion suppresses the individual's taking an active role in distinguishing right from wrong.

However, in his later years, Kohlberg softened his stance toward religion as he confronted the meta-ethical question of "Why be moral in an immoral world?" Doing so led to his adopting a positive view of how religious development (or, more specifically, faith development) can support moral development. He came to believe that the primary function of religious structures is to validate and thereby support being moral. Religious structures do this by grounding morality not in promises of personal gain but in faith in human nature and in a cosmic order (Kohlberg, 1981).

To an extent, Kohlberg saw religious development as the by-product or outcome of moral development. Therefore, just as logical structures are necessary but not sufficient for the development of moral structures, moral structures are necessary but not sufficient for the development of religious (faith) structures (Kohlberg, 1981).

This reverses the usual way of relating moral and religious development. Usually, morality is thought of as the outcome of religious and spiritual development. This is the way that laypersons think, and it was also the way that William James thought. In James's (1902) discourse on saintliness, he began not with morality but with the saint's experience of being connected to an unseen, beneficent power. The by-product or "fruit" of this experience was, for James, a powerful and positive morality.

How should we understand this relationship between moral development and religious and spiritual development—in Kohlberg's terms, in James's terms, or of some alternative? And how do the findings of research help us decide?

The necessary but not sufficient hypothesis (Kohlberg & Power, 1981, p. 227) has been tested by several studies—with mixed results. Caldwell and Berkowitz (1987) found in their interviews with 50 Wisconsin students (mean age = 16.4 years) that students' stages of moral judgment were, as a rule, higher then their stages of religious judgment, as measured by the Oser and Gmünder scales. In contrast, studies by Gut (1984) found that a quarter of her sample scored higher on stages of religious judgment than on stages of moral judgment. Considering inconsistent results such as these, more research is needed to determine the exact relationships between the development of moral and religious judgment.

However, recent research on moral *functioning* as distinguished from moral *judgment,* has shown a more intimate and subtle connection between moral development and religious and spiritual development than that characterized in discussions about stages of moral and religious judgment. For example, in a study of adult moral exemplars, Colby and Damon (1992) found that the majority of their sample acted out of some sense for the transcendent and that morality, spirituality, and identity were fused in such a way as to sustain their lives of caring. In other words, caring was, for them, who they were or who they became. In a similar vein, Walker and his colleagues found general support for William James's thesis that authentic religious experience is evidenced in mature moral functioning (Walker, 2003; Walker & Pitts, 1998; Walker, Pitts, Hennig, & Matsuba, 1995; Walker & Reimer, 2005).

These findings refer to "authentic religious experience" and to "mature moral functioning." But what about religious experience that may not be authentic or true to the core values and beliefs of a faith tradition? The results show negative or ambiguous connections between religion and morality: For example, a number of studies have found a clear and positive correlation between ritual attendance, orthodox beliefs, and racial prejudice (Batson et al., 1993). Other studies (B. Hunsberger, 1995) have found a curvilinear effect such that the most religious and the totally irreligious are the least prejudiced. With regard to prejudice, there are no straightforward influences of religion on morality. Similarly, several studies have found only a weak effect of religion in preventing delinquency (Hood et al., 1996). It seems that positive relationships between moral development and religious and spiritual development are most evident at higher stages or when religious and spiritual experience becomes authentic and in accord with positive faith traditions.

Service

Reference to moral exemplars reminds us that moral development involves much more than judgment and reasoning. It also involves action. One measure of moral development is service to others. How does religious and spiritual development relate to community service in those who have yet to become moral exemplars? Most of the research has been about adolescents and their involvement in religious institutions and community service.

A number of studies have demonstrated a positive relationship between involvement in religious institutions and community service. For example, Youniss et al. (1999) found that high school students who valued religion were vibrantly engaged in their schooling and in the betterment of their communities.

For adolescents, community service in the context of religious institutions seems to have a different and more positive meaning than community service in other contexts. For example, Donnelly and his colleagues (Donnelly et al., 2005) have demonstrated that adolescents doing community service in the context of religious institutions as compared to those doing community service in other contexts are more likely to do community service later on, in their adult lives.

Coping

One of the fundamental and undoubtedly universal functions of religiousness is coping, especially in critical life events such as the death of a loved relative and serious illness. Certainly, long before psychologists studied coping processes, religions have disposed resources for facilitating coping.

In the past decades, *coping* has become a very important concept in the psychology of religion (Pargament & Brant, 1998). Pargament and Brant distinguished the following types of religious coping:

- *Self-directed coping,* as when subjects use God-given resources to individually solve their problems.
- *Deferring coping,* as when individuals, especially in seemingly hopeless situations, give up control to a higher power or God, thereby paradoxically gaining control (Baugh, 1988).
- *Collaborative coping,* as when individuals appraise God as a helping partner.

Out of the hundreds of studies on religious coping, most support the following points:

- One of the most frequently used religious coping strategies is prayer.
- Religious coping is more frequent among females, older individuals, blacks, and those who are less educated.
- If individuals have faith in a loving God, the outcomes of religious coping are more apt to be less stress, less anxiety, a greater sense of well-being, and greater capacity for handling difficulties than if they evaluate negative life events as God's punishment.
- Usually, the outcomes of collaborative religious coping are more promising than are the outcomes of other styles.

But how does a person develop competencies in coping? And why do people prefer different coping styles? The lack of explicitly developmental analyses (coping styles at different stages of religious judgment, etc.) is a limitation in this research—a limitation that makes it difficult to answer these and other important questions having to do with coping and religious and spiritual development.

Positive Correlates in Advanced Age

The considerable benefits of religiousness and spirituality in advanced age warrant special attention. From his studies, Argyle (1987) concluded that for older people, religiousness and well-being are closely tied together. Levin (1997) also demonstrated that for many older people, religiousness has significant and positive effects.

Religiousness obviously has a striking effect on how old age is experienced. For example, in one study, out of 1,011 elderly men surveyed, a distinct majority said religiousness was more important to them than it was in their middle years (Koenig, 1994). This seems to be especially true for older women (Mc Fadden, 1996). The older the subjects are, the more powerful are their beliefs in a personal God, and the more their faith provides help with problems in living (Jörns, 1997).

Yet, religious activities diminish in old age (Blazer & Palmore, 1976). Many seniors, on account of their frailty and illness, are no longer capable of active participation in congregations. However, this lack is compensated for by an increase in unorganized, private religious practice, especially prayer.

The obvious benefits produced by religiousness and spirituality in old age are integration and social support, the creation of meaning and purpose, fostering a greater sense of control and maintaining better health. These points can be summarized as follows:

- Religious communities offer integration and social support. Scales for loneliness are more powerfully correlated in a negative way for the elderly than for younger people, and the benefits of church membership are greater for people in retirement or who have been widowed (Argyle, 1987). Religious communities create a bolstering environment in which burdensome life events, such as bereavements, can more easily be coped with. Religious communities also produce an atmosphere of acceptance, hope, and forgiveness (Koenig, 1992). In her wide ranging Yale Health and Aging Project, Idler (1994) found that being integrated with a religious community predicted less depression and lower suicidal tendencies.
- Religions can additionally create an inner sense of security by offering meaningful rites and symbols (Argyle, 1987). They can provide a sense that life as a whole, with its high-points, its lows, and its finiteness, is meaningful. Religiousness is a protective factor against problems of meaning (Dittmann-Kohli, 1990).
- Through the lens of religion, death, which looms ever more inexorably in old age, can be interpreted as the beginning of a better world, as the transition into eternal life or as something natural and positive. As Meadow and Kahoe (1984) report that immortality seems to be the single item of faith that increases substantially with age.
- Religiousness has always been connected with convictions about control, even though we might believe that the religious person is ceding control to a divine being (control illusion). Well-being presupposes possibilities of control. Baugh (1988) reduced this control paradox to the formula, "Gaining control by giving up control." Ceding control to a higher power unburdens the spirit and makes it easier to cope. For example, in the Duke longitudinal study, 100 elderly participants, when asked how they dealt with stressful experiences (death of relatives, etc.), frequently named having trust and belief in God (Koenig, George, & Siegler, 1988).
- Most religions prescribe a code of behavior, which promotes good physical health, and this correlates

highly with happiness and satisfaction with life (Argyle, 1987, p. 176). The greater extent of well-being enjoyed by religious people in old age is also explained by pointing out that they rarely smoke or drink alcohol and eat with greater moderation.

NEGATIVE CORRELATES AND PATHOLOGY

The preceding section has shown that spirituality and religiousness exert positive influences. The term *religion,* however, also elicits images of September 11th, 2001 and of Jonestown, Guyana. We need to look at the evidence for negative and not just positive correlates. However, before doing so, we begin by discussing the negative biases against religion, which, in the social sciences, have impeded progress in sorting out negative from positive.

With respect to religious and spiritual development, the history of both psychological research and clinical practice has been a history of negative bias and prejudice. Bias and prejudice persist today but has perhaps lessened—both because of a new tolerance for cultural diversity and because of empirical research that has challenged old negative stereotypes. Nevertheless, we begin with a brief discussion of the most obvious negative biases and prejudices because their persistence presents a significant roadblock to understanding negative correlates and pathology associated with religious and spiritual development.

Negative bias is particularly evident in stereotyping—in collapsing meaningful distinctions into one negative category. Stereotyping the religious and a failure to make distinctions has been the hallmark of negative bias among research psychologists and clinicians. An overview of the literature indicates that rarely are distinctions made when discussing central religious concepts such as *belief, faith,* and *revelation.* Yet, there are many meanings for each of these three, and the differences matter.

With regard to the concept of belief, research psychologists and clinicians have customarily equated the meaning of religious belief with the meaning of belief as it is used when speaking of, say, belief in trees and dogs, though the two meanings differ from one another (Blackstone, 1963). With regard to the concept of faith, and, as previously discussed, research psychologists and clinicians have customarily equated faith with belief despite these two concepts having quite different meanings in the history of faith traditions (W. C. Smith, 1998a). With regard to the concept of revelation, they have generally given one single meaning to revelation when there are several, including meanings that acknowledge multiple interpretations of sacred texts and religious experience (Dulles, 1994).

Without making important distinctions between the meanings of these and other central religious concepts, religion easily appears to consist mostly of irrational belief and dogmatic, childish denial that truth is a matter of interpretation and argument. Add a quantitative dimension to the discussion, and such negative views of religion often turn into pathologizing religion whenever religion is taken seriously. One is reminded of Albert Ellis's (1980) remark, "The less religious (people) are, the more emotionally healthy they will tend to be" (p. 637).

Failure to make meaningful distinctions has been one problem. Making false distinctions has been another. Perhaps the most obvious example of making a false distinction is between science and religion, such that one is pitted against the other. This distinction often goes unchallenged, despite the fact that the majority of religious persons who are also scientists find no contradiction in being both, and despite the fact that only a small minority of the religious people believe in unscientific theories such as creationism (Gould, 2003b).

This last reference to creationist theory brings up a third prejudicial practice among researchers and clinicians—the practice of selecting unrepresentative examples to support arguments against religion. An example of this practice occurred on the *DSM III-R*'s glossary of terms for defining mental disorders—where an inordinate number of examples with religious content were given to illustrate what is meant by various mental disorders (Larson et al., 1993).

A fourth prejudicial practice has been to report, as objective fact, findings based on flawed, value-laden measures that are biased against religion. For example, on the Minnesota Multiphasic Personality Inventory (MMPI), answering positively to the statement, "I am orthodoxly religious" lowers one's overall score (Gartner, 1996). Such soft measures express the value system of a select group—often proponents of secular humanism and self-actualizing theory (Maslow, 1971).

Researchers in religious psychology have been particularly harsh on fundamentalist groups. Fundamentalists are routinely lumped together to form a negative stereotype consisting of character traits such as *immature, dogmatic, rigid,* and *prejudiced.* There is evidence to support the claim that religious fundamentalism is indeed associated with higher levels of prejudice, authoritarism, and an

"us versus them" mentality (Altemeyer, 2003), however, at least one study suggests that prejudice is not confined to any one group and that groups of so-called healthy, quest-orientated individuals are also prejudiced, especially toward fundamentalists (Goldfried & Miner, 2002).

The point is not that the religious are problem free or that there is no pathology associated with religious and spiritual development. We need not go to the opposite extreme. However, in the history of religious research and clinical practice, there has been persistent negative bias against religion. Religious and spiritual development is a complex phenomenon that challenges us to make numerous distinctions and be scrupulous about evidence and measures. Pathology is real and does not reside in the eyes of the diagnostician, but pathology, as a concept, needs to be used with care.

Having clarified some misunderstandings that have impeded progress, we can turn now to recent research on psychopathology as it relates to religious and spiritual development. We discuss the subjects of cults, occultist practices, terrorist groups, mental disorders, and pathogenic (toxic) religious practices and beliefs—as they relate to religious and spiritual development.

Cults, Occultist Practices, and Terrorist Groups

With regard to cults, occultist practices, and terrorist groups, the literature suggests two points in particular. The first point is that problems of definition have created biases that impede the progress of research on cults. The second point is that there is no conclusive evidence that members of so-called cults are any more developmentally disturbed or pathological than are individuals who do not join cults or terrorist groups.

Cults and Occultist Practices

Historically, the term *cult* has had a neutral meaning—both in faith traditions and in the sociology of religion. However, since the 1960s and especially since the Jonestown and Waco tragedies (in Jonestown 912 people of the Temple Sect died by an organized mass suicide; in Waco, 74 disciples of David Koresh perished by a massacre), the term has been defined by the media and certain government agencies as referring to a particular kind of group, one with a self-appointed, dogmatic, and charismatic leader who promotes deceptive-coercive recruitment practices to ensnare individuals to join a totalitarian community organized to solicit funds and secure favors that benefit neither the group's members nor society (Barrett, 2001). The media sometimes adds negative terms such as *brain-washing* to characterize the socialization of cult members. This negative definition of cults works well as an ideal type for identifying harmful cults, but the definition has been applied indiscriminately and to religious groups that do not fit the definition. As a result, discussions of cults are often polemical and groups of researchers are divided into "cult critics" and "cult sympathizers."

Cult sympathizers are more likely to use the terms *new religious movements* (NRM) and *alternative religions* instead of cult, though these terms, too, have their problems. Certain groups considered by most to be cults are not new and in some contexts would not be alternatives to the mainstream. The International Society for Krishna Consciousness, otherwise known as the Hare Krishna, is an example (Daner, 1976). Nevertheless, new religious movements or alternative religions have become accepted terms. Cult sympathizers point out, tongue in cheek, that the difference between a cult and a religion is about a million members (D. Barrett, 2001).

There is also misunderstanding about the average age of cult members. Cults are associated with "youth religions," which came into prominence in the 1970s. However, the average age of cult members is estimated to be between 25 and 40 (Schmitz & Friebe, 1992). For those in Bhagwan Shree Rajneesch, living in Oregon, the average age is 34 years (Richardson, 1995).

Concerning the second point about who joins cults, the available evidence suggests that members generally are no more pathological than are nonmembers (Richardson, 1995). In explaining why and how a person comes to join a cult, a more historical, less psychological approach may work best because circumstances play a decisive role. For example, a newly arrived freshman at college may, along with other freshman, feel lonely and disoriented but adjust without joining a cult, however if that freshman happens to meet and talk with a cult member, he or she may well end up joining a cult (D. Barrett, 2001).

These words of caution about rushing to judge cults aside, the extreme example of religion taking the wrong course is still taken to be the norm. A clear majority of Europeans live in a state of alert on account of religious cults (Schmidtchen, 1987), and in the United States, there is a similar negative view as well. Pfeiffer (1992) showed that the overwhelming majority of American students (82%) described cult members purely in negative terms, deeming them to be less happy, less intelligent, and less free.

Of particular relevance to developmental psychology is the question of what leads individuals to join cults. Several clinical studies conducted mostly with persons who had left cults, established that before joining cults, many members had serious family and nonfamily problems (Klosinski, 1996). By some accounts, life before joining a cult was characterized by a history of poor relationships with both parents and peers (Silverstein, 1988). In her sample, Rollett (1996) also found that young people with a high exposure to crises tended more strongly toward joining cults. Others have characterized those who join cults as persons who have suffered from the absence of a father during childhood and who have difficulty dealing with the complexities of life (Ullman, 1982). This is consistent with the finding of one study that showed that new converts to cults held stronger authoritarian values than did nonconverts (Shaver, Leneuaer, & Sadd, 1980).

Popular empirical accounts often deliver the blanket judgment that cults rob their members of freedom, individuality, and wealth. These accounts accuse cults of fostering dislocation from reality, thought paralysis, and regression (Lademann-Priemer, 1998). The doctrines of many cults do seem to operate on lower developmental stages—as when cults divide humanity into small groups of those who are good and saved, from the great majority who are bad and lost (Brickerhoff & MacKie, 1986). As another example, the Krishnas, who consider a doll to be the Divine itself, seem to collapse the distinction between a religious symbol and its referent (Cassirer, 1955; Fowler, 1981).

However, negative characterizations of those joining cults may well be the result of interviewing mostly those who have left cults because they were dissatisfied—the research may be biased toward having a negative view because the sample of former cult members is a biased sample (Richardson, van der Lans, & Derks, 1986).

As for the effects of joining cults, in the worst cases, the results have been fatal, especially authoritarian leaders or closed groups hinder development toward religious maturity and autonomy, respectively if they produce a childish and inflexible dependence. Fatal or otherwise, seriously harmful effects may happen, especially when cult members engage in occultist practices. In the past decade, occult forms of religiousness among adolescents have become, at least in Europe, a popular theme (Helsper, 1992). Headlines have covered tragic deaths of young people after they performed occult practices such as moving glasses and holding séances.

However, some researchers have shown positive effects of cults. Salzman (1953) found that cults sometimes help members to cope. In a survey of 517 members of the Unification Church and of Ananda Marga, Kuner (1981) showed that long-term membership produced "resocializing" and "therapeutic" effects. Schibilsky (1976) found that joining cults helped members cope with developmental tasks such as forming an identity and developing self-discipline. As another example of positive effects, Wicca groups have been described as empowering women and helping them to heal wounds inflicted on them in societies where women, especially lesbians, have been disempowered or hurt by homophobia (Warwick, 1995).

Positive views of the effects of cults are sometimes accompanied by the observation that cults help individuals make a transition. People often belong to cults on a temporary basis and experience them as "havens" (Hood et al., 1996). In his thorough meta-analysis of clinical studies on the psychological effects of joining cults, Richardson (1995) concluded that membership is often therapeutic instead of harmful.

Related findings on occultist practices have shown that what may at first appear to be psychopathology of a religious or spiritual nature can be, on closer inspection, a means for spiritual growth. For example, Streib (1999) described the occultist practices of the groups of European adolescents he observed as "off-road religion," implying that they were age and stage appropriate for those who have yet to achieve an adult identity. Furthermore, and contrary to popular negative views, the overwhelming majority of studies have shown that only a minority of teenagers regularly perform occult practices, and for most in this minority, occult practices are performed out of curiosity and not from existential engagement.

Occult practices, rather than expressing pathology, can express religious affiliation and religious stage. Rollett (1992) demonstrated that catholic youth are more attracted to occultism than are youth without any religious denominations, and Bucher (1994) showed that adolescents at stage 2 of religious judgment according to Oser and Gmünder (1991) consider occult practices as being plausible, more so than do adolescents at stage 3.

Terrorist Groups

Similar to what was has been said about cults, what constitutes a terrorist group depends on one's perspective (Scarlett, 2003). Those identifying with or participating in such groups define the groups very differently than outsiders—as aggrieved victims of violent injustice (Silke, 2003). For them, the group is all about justice and freedom, not what is implied by the term *terrorist group.*

Becoming a member of a terrorist group can be seen and experienced as entirely natural and normal—somewhat akin to joining the army or police in times of war or crisis (Silke, 2003). In sum, terrorists, on average, have no appreciable psychopathology and are average with respect to level of education and socioeconomic status. It seems that terrorism is more a group phenomenon than it is an individual phenomenon—and should be studied as such.

There is a particular need for research on religion's role in stimulating terrorism and for understanding better what leads to religiously sponsored evil. Kimball (2002) provides a framework for explaining—using the following list of symptoms for evaluating when religion is in danger of supporting evil:

- Inhibition of (religious) autonomy and freedom
- Absolute truth claims
- Blind obedience
- Establishing an ideal time
- Claiming the end justifies the means
- Declaring Holy War

What should we conclude from this overview of how the literature discusses cults, occultist practices, and terrorist groups? If there is no more psychopathology, on average, within these cults and terrorist groups than without, are there no problems? Obviously, there are severe problems. There are cults that deceive, abuse, and kill, and terrorist groups inflict immeasurable harm and suffering on thousands of innocents. However, the problems do not fit neatly into the category of psychopathology—unless the category itself is expanded to fit just about everyone. With respect to cults, the main conclusions are the following:

- We need to distinguish harmful cults from those new religious movements that do no harm. In doing so, we can apply criteria such as deception, manipulation, coercion, and developmental stage but not without a careful examination of the evidence.
- We need to develop reliable measures to evaluate cults in short- versus long-term functioning.

With respect to terrorist groups, the main conclusions are the following:

- We need to focus on changing the social and political conditions leading to essentially normal religious individuals joining terrorist groups.
- We need to focus on educating the general public about those social and political conditions to minimize the demonizing that continues the cycle of violence.

Mental Disorders

As used here, the concept of a mental disorder is the same as used in major classification systems such as the *American Psychiatric Association's Diagnostic and Statistical Manual* (*DSM*). These classification systems have a number of conceptual and practical advantages over dimensional approaches (Cantwell & Rutter, 2002). However, they also have disadvantages. Professionals agree that classification systems should be used in conjunction with dimensional approaches to correct for their inherent deficiencies. With this cautionary point made, we can proceed to discuss how the current literature treats religious and spiritual development with respect to mental disorders as defined by classification systems, particularly by the *DSM-IV*.

First, with regard to the *DSM-IV* itself, this revised form includes a V-code for "Other Conditions"—those conditions that occasionally warrant a clinician's help but which do not constitute mental disorders. "Medication-induced movement" disorder is one example, and "Religious or spiritual problem" is another.

Including the V-Code "Religious or spiritual problem" marks a step forward—because it says that problems with a religious or spiritual content should not be automatically pathologized. However, some have argued that the inclusion of religious and spiritual problems as one of several "other conditions" marginalizes these problems when, in certain cases, they should not be marginalized (Scott, Garver, Richards, & Hathaway, 2003).

As for the other categories defining mental disorders, the picture is more complex. Perhaps the best overall characterization of the research is that with these other categories (psychotic disorders, mood disorders, etc.), religiosity and spirituality can define the content of the disorders (e.g., having delusions with religious content), but there is no evidence that religiosity and spirituality cause these disorders. For example, the frequency of religious delusions in groups of psychotic individuals varies considerably depending on the group sampled—as much as between 7% and 45% (Kingdom, Siddle, & Rathod, 2001)—suggesting psychotic individuals use whatever content is available in their culture to construct their delusions.

A further point about complexity is made with regard to individuals with the same diagnosis but who differ from one another in their religiosity. For example, when accompanied by strong religious faith, depression may have a very different and more positive meaning with respect to ability to function than depression without faith (Stone, 2000). Stage dependence should also be considered.

Pathogenic (Toxic) Religious Beliefs, Practices and Attitudes

Perhaps the best researched problem of this sort has been that of *prejudice* and its relationship with religion. One of the most consistent findings has been that moderate and superficial levels of religious involvement predict high levels of prejudice (Allport & Ross, 1967). The distinction here is between *extrinsic* and *intrinsic* religious orientation or those who use religion for self-serving means such as making social connections versus those whose core identity is defined by their faith tradition. It is not that religion fosters prejudice so much as it is how individuals use their religion. Just why intrinsic types are similar on measures of prejudice to nonreligious types is unclear.

However, there are clear instances of religiously sponsored prejudice that should be distinguished from the psychological prejudice manifest in extrinsic religious orientation. For example, certain fundamentalist groups find in the Bible grounds for considering homosexuality a sin. Religiously sponsored prejudice and the psychological prejudice in extrinsic religious orientation are quite different in nature and should be discussed, explained, and treated separately. This distinction between psychological problems of individuals and problems associated with a group's thinking comes up when discussing cults and terrorist groups as well.

Religious attributions (see Spilka & McIntosh, 1995) can foster self-esteem and psychic equilibrium, but they can also weaken them. In particular, a person's ability to cope can be impeded when critical events in life are attributed to the *punishment of God,* which traditional religious instruction used to encourage. Such attributions foster feelings of anger, helplessness, shame, and fear (Pargament, Ensing, & Falgout, 1990), and they undermine self-effectiveness (Di Loreto & Oser, 1996). For example, 13% of the cardiac patients interviewed by Croog and Levine (1972), convinced themselves that their illness was a punishment for earlier sins, and, in so doing, damaged their ability to cope—as measured by their recovery time being longer and their sense of well-being being poorer than for those without negative religious attributions. An avenging God brings about guilt feelings and can drive the self into punishing itself if it perceives itself to be disobedient in the eyes of God (Hood 1992, p. 118). As another example and on the basis of clinical studies, Frielingsdorf (1992) described shocking examples of casuistry, where people lost all self-respect and felt themselves to be "like dirt" on account of demonic images of God. He found that these people were often unwanted and neglected as children.

What can we conclude about the research reported on negative correlates and pathology related to religious and spiritual development? For one thing, we seem to be just at the beginning stage. To build an adequate research base, we need to develop a more nuanced description system for defining problems of a religious and spiritual nature. There are, for example, conceptual reasons for distinguishing between different forms of problematic faith. There is idolatrous faith, structurally immature faith, dysfunctional faith, and structurally developed faith whose content promotes evil (Scarlett, 2003). We need more research to establish whether these and other distinctions can be used scientifically to further define problematic religious and spiritual development. One of the main reasons for our adopting a normative, stage-structural analysis of religious and spiritual development becomes clear when discussing problems relating to religiosity and spirituality. A normative analysis is crucial for evaluating these problems and for developing the right means to solve them.

CONCLUSIONS

One goal for this chapter was to connect disparate voices in developmental science in general and in the study of spiritual and religious development in particular. Obviously, a field is enriched by there being different voices and alternative perspectives. Especially when the topics in the study of religious and spiritual development have been about culture, stages of development, and the relationship between belief and faith development, additional perspectives and more research are needed. Nevertheless, we have argued in this chapter that there are meaningful ways to attend to individual and cultural differences while still attending to what is universal and normative. We need to find ways to attend integratively to both diversity and general principles, and we also need to attend to matters of belief as well as to matters of faith.

Another goal of this chapter was to make our own position clear, and to explain why we believe that a constructivist and normative, stage-structural approach

will always be needed. Stage theory is indispensable for defining religious and spiritual development, and it provides possibilities for guiding interventions designed to support religious and spiritual development. In addition, a stage-structural approach can provide ways to explain universals in religious and spiritual development.

We contend that higher stages of positive religious and spiritual development provide adaptive functions. The current body of evidence seems to bear us out. The main functions provided by mature, positive faith have to do with giving humans hope for a better world, fostering greater tolerance and respect for others, and providing motivation to work for justice, demonstrate care, and experience well-being even in the face of adversity.

However, the main goal of this chapter has been to show the richness and importance of research and thinking in the study of spiritual and religious development. This chapter is the first on religious and spiritual development to appear in the *Handbook of Child Psychology,* although its inclusion was anticipated about a decade ago (Cairns, 1998; see also Cairns, Chapter 3; Lerner, Chapter 1, this *Handbook,* this volume), We hope and trust that it will not be the last—given that the study of religious and spiritual development is so central to our understanding of human development.

Furthermore, this field is expanding rapidly, and the next edition of the *Handbook* will likely be reporting on exciting new research findings in areas not even noted in the present chapter. For example, there are beginning efforts to connect research on brain development to religious and spiritual development, and, while there are currently no good bridge theories (J. A. Feldman, in press) that adequately connect mind to brain to make the brain a truly useful source of explanations for religious and spiritual development, those theories are likely to be in place by the time of the next edition. The same predication may be forwarded about other areas either not discussed at all in this chapter or reported on only slightly. For example, we expect that the research now being conducted on the role of spirituality in youth development will yield a much better account of interactions between organismic and contextual factors central to religious and spiritual development. In sum, the future of theory and research on religious and spiritual development seems, at this writing, to be a bright and scientifically productive one.

REFERENCES

Ainsworth, M. D. S. (1978). *Patterns of attachment: A psychological study of the strange situation.* Hillsdale NJ: Erlbaum.

Allport, G. W. (1950). *The individual and his religion: A psychological interpretation.* New York: Macmillan.

Allport, G. W., & Ross, J. (1967). Personal religious orientation and prejudice. *Journal of Personality and Social Psychology, 5,* 432–443.

Altemeyer, B. (2003). Why do religious fundamentalists tend to be prejudiced? *International Journal for the Psychology of Religion, 13*(1), 17–28.

Andersen, D. S. (1988). Values, religion, social class and the choice of private school in Australia. *International Journal of Educational Research, 12,* 351–373.

Andresen, J. (2002). Meditation meets behavioral medicine: The story of experimental research on meditation. In I. J. A. R. K. Forman (Ed.), *Cognitive models and spiritual maps* (pp. 17–64). Charlottesville, VA: Imprint Academic.

Anthony, S. (1940). *The child's discovery of death.* London: Routledge & Kegan.

Argyle, M. (1987). *The psychology of happiness.* London: Methuen & Co.

Argyle, M. (1999). Causes and correlates of happiness. In I. D. Kahnemann, E. Diener, & N. Schwartz (Eds.), *Well-being: The foundations of hedonic psychology (pp. 353–373).* New York: Russell Sage Foundation.

Argyle, M. (2000). *Psychology of religion: An introduction.* New York: Routledge.

Aronoff, J. S., & Lynn, S. (2000). Are cultic environments psychologically harmful? *Clinical Psychology Review, 20*(1), 91–111.

Atran, S., & Norenzayan, A. (2005). Religion's evolutionary landscape: Counterintuition, commitment, compassion, communion. *Behavioral and Brain Sciences, 27*(6).

Austin, J. A. (1997). Stress reduction through mindfulness meditation: Effects on psychological symptomatology, sense of control, and spiritual experiences. *Psychotherapy and Psychosomatics, 66,* 97–106.

Baltes, P. B., Lindenberger, U., & Staudinger, U. M. (1998). Lifespan theory in developmental psychology. In W. Damon (Editor-in-Chief) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., 1029–1144). New York: Wiley.

Barnes, E. (1892). Theological life of a Californian child. *On Pedagogical Seminary, 2,* 442–448.

Barrett, D. (2001). *The new believers: A survey of sects, cults, and alternative religions.* London: Cassell.

Barrett, J. (2001). Do children experience God as adults do. In J. Andresen (Ed.), *Religion in mind: Cognitive perspectives on religious belief, ritual, and experience* (pp. 173–191). Cambridge, England: Cambridge University Press.

Barrett, J., & Keil, F. (1996). Conceptualizing a non-natural entity: Anthropomorphism in God concepts. *Cognitive Psychology, 31,* 219–247.

Barth, C. (1911). Der Himmel in der Gedankenwelt 10- und 11-jähriger Kinder. *Monatsblätter für den Evangelischen Religionsunterricht, 4,* 336–338.

Batson, C. D. V. W. L., Schoenrade, P., & Ventis, W. L. (1993). *Religion and the individual.* New York: Oxford University Press.

Baugh, J. R. (1988). Gaining control by giving up control: Strategies for coping with powerlessness. In I. W. R. Miller & J. E. Martin (Eds.), *Behavior therapy and religion* (pp. 125–138). Newbury Park, CA: Sage Publications.

Beile, H. (1998). *Religiöse Emotionen und religiöses Urteil: Eine empirische Studie über Religiosität bei Jugendlichen.* Ostfildern: Schwabenverlag.

Beit-Hallahmi, B. (1989). *Prolegomena to the psychological study of religion.* Lewisburg, PA: Bucknell University Press.

Beit-Hallahmi, B. (1996a). *Psychanalytic studies of religion: A critical assessment and annotated bibliography.* Westport, CT: Greenwood Press.

Beit-Hallahmi, B. (1996b). Sense in nonsense: The psychoanalytic approach to religion. In J. Rozenberg (Ed.), *Sense and nonsense: Philosophical, clinical and ethical perspectives.* Jerusalem: Hebrew University Magnes Press.

Beit-Hallahmi, B., & Argyle, M. (1997). *The psychology of religious behavior, belief, and experience.* New York: Routledge.

Benish, G. (2001). *Heart and home: Embracing the spiritual in everyday life.* New York: Kensington.

Benson, P. L. (1992). Religion and substance use. In I. J. Schumaker (Ed.), *Religion and mental health* (pp. 157–179). New York: Oxford University Press.

Benson, P. L., Donahue, M. J., & Erickson, J. A. (1993). The faith maturity scale: Conceptualization, measurement, and empirical validation. *Research in the Social Scientific Study of Religion, 5,* 1–26.

Benson, P. L., Roehlkepartain, E. C., & Rude, S. P. (2003). Spiritual development in childhood and adolescence: Toward a field of inquiry. *Applied Developmental Science, 7,* 205–213.

Berg, M. (2001). *The way: Using the wisdom of Kabbalah for spiritual transformation and fulfillment.* New York: Wiley.

Blackstone, W. (1963). *The problem of religious knowledge.* Englewood Cliffs, NJ: Prentice-Hall.

Blakeney, C. D., & Blakeney, R. F. (2005). Delinquency: A quest for moral and spiritual integrity? In E. C. Roehlkepartain, P. King, L. Wagener, & P. Benson (Eds.), *The handbook of spiritual development in childhood and adolescence* (pp. 371–383). Thousand Oaks, CA: Sage.

Blakeney, C. D., Blakeney, R. F., & Reich, K. H. (2005). Leaps of faith: The role of spirituality in recovering integrity among Jewish alcoholics and drug addicts. *Mental Health, Religion and Culture, 8,* 1–19.

Blazer, D., & Palmore, E. (1976). Religion and aging in a longitudinal panel. *Gerontologist, 16,* 82–85.

Boyatzis, C., Dollahite, D., & Marks, L. (2005). The family context of children's spiritual and religious development. In E. C. Roehlkepartain, P. King, L. Wagener, & P. Benson (Eds.), *The handbook of spiritual development in childhood and adolescence* (pg. 297–309). Thousand Oaks, CA: Sage.

Boyatzis, C. J., & Janicki, D. (2003). Parent-child communication about religion: A survey and diary assessment of unilateral transmission and bi-directional reciprocity. *Review of Religious Research, 44,* 252–270.

Boyer, P., & Walker, S. (2000). Intuitive ontology and cultural input in the acquisition of religious concepts. In K. Rosengren, C. Johnson, & P. Harris (Eds.), *Imagining the impossible* (pp. 130–156). New York: Cambridge University Press.

Brickerhoff, M. B., & MacKie, M. (1986). The applicability of social distance for religious research. *Review of Religious Research, 28,* 151–167.

Brown, L. B. (1967). Egocentric thought in petitionary prayer: A cross-cultural study. *Journal of Social Psychology, 68,* 197–210.

Brown, L. B. (1987). *The psychology of religious belief.* London: Academic Press.

Brown, L. B. (1994). *The human side of prayer: The psychology of praying.* Birmingham, AL: Religious Education Press.

Bucher, A. (1991). Understanding parables: A developmental analysis. In F. K. Oser & G.W. Scarlett (Eds.), *New Directions for child development: Religious development in childhood and adolescence* (pp. 101–105). San Francisco: Jossey-Bass.

Bucher, A. (1994). Ist Okkultismus die neue Jugendreligion? Eine empirische Untersuchung an 650 jugendlichen. *Archiv fur Religionpsychologie, 21,* 248–266.

Bucher, A. (2000). *Religionsunterricht zwischen Lernfach und Lebenshilfe: Eine empirische Untersuchung zum katholiscchen Religionsunterricht in der Bundesrepublik Deutschland.* Stuttgart, Germany: Kohlhammer.

Bucher, A. (2004). *Psychobiographien religioser Entwicklung Glaubensprofile zwischen Individualitat und Universalitat.* Stuttgart, Germany: Kohlhammer.

Burgardsmeier, A. (1951). *Gott und Himmel in der psychischen Welt der Jugend: Vom dritten Schuljahr bis zum Ausgang des Volksschulalters.* Düsseldorf, Germany: Schwann/Patmos-Verlag.

Burkert, W. (1996). *Creation of the sacred: Tracks of biology in early religions.* Cambridge, MA: Harvard University Press.

Cairns, R. B. (1998). The making of developmental psychology. In W. Damon (Editor-in-Chief) & R. M. Lerner (Vol. ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 25–105). New York: Wiley.

Caldwell, J. A., & Berkowitz, M. L. (1987). Die Entwicklung religiösen und moralischen Denkens in einem Programm zum Religionsunterricht. *Unterrichtswissenschaft, 15,* 157–176.

Calvin, J. (1834). Commentarius in Epistolam ad Ephesios. *Corpus Reformatorum, Berlin, 79,* 141–240.

Cantwell, D., & Rutter, M. (2002). Classification: Conceptual issues and substantive findings. In S. B. Thielman (Ed.), *Child and adolescent psychiatry* (4th ed., pp. 3–19). Cambridge, MA: Blackwell Science.

Caplovitz, D., & Sherrow, F. (1977). *The religious drop-outs: Apostasy among college graduates.* Beverly Hills, CA: Sage.

Case, R. (1985). *Intellectual development: Birth to adulthood.* New York: Academic Press.

Cassirer, E. (1955). *The philosophy of symbolic forms: Vol. 2. Mythical thought.* New Haven, CT: Yale University Press.

Cavilli-Sforza, L. (1982). Theory and observation in cultural transmission. *Science, 218,* 19–27.

Colby, A., & Damon, W. (1992). *Some do care: Contemporary lives of moral commitment.* New York: Free Press.

Coles, R. (1990). *The spiritual life of children.* Boston: Houghton Mifflin.

Condorcet, J. A. (1976). *Entwurf einer historischen Darstellung der Fortschritte des menschlichen Geistes.* Frankfurt, Germany: Suhrkamp. (Original work published 1789)

Cronon, W. (Ed.). (1997). *John Muir: Nature writings.* New York: Penguin Putnam.

Croog, S., & Levine, S. (1972). Religious identity and response to serious illness: A report on heart patients. *Social Science and Medicine, 6,* 17–32.

Daecke, M., & Schnakenberg, J. (2000). *Gottesglaube—ein Selektionsvorteil? Religion in der Evolution.* München, Germany: Kaiser.

Damon, W. (Ed.). (2002). *Bringing in a new era in character education.* Stanford, CA: Hoover Institution Press.

Daner, F. (1976). *The American children of Krsna: A study of the Hare Krsna movement.* Stanford, CA: Stanford University Press.

Darley, J. M., & Batson, C. D. (1973). From Jerusalem to Jericho: A study of situational and dispositional variables in helping behavior. *Journal of Personality and Social Psychology, 27,* 100–108.

Deconchy, J.-P. (1967). *Structure génétique de l'idée de Dieu chez des Catholics Français.* Brussels, Belgium: Lumen Vitae Press.

Denz, H. (2002). *Die europäische Seele: Leben und Glauben in Europa.* Wien: Czernin Verlag.

Dick, A. (1981). *Drei transkulturelle Erhebungen des religiösen Urteils: Eine Pilotstudie.* Unveröffentlichte Lizentiatsarbeit, Freiburg, Switzerland: CH.

Di Loreto, O., & Oser, F. (1996). Entwicklung des religiösen Urteils und religiöser Selbstwirksamkeitsüberzeugung: Eine Längsschnittstudie. In F. Oser & K. H. Reich (Eds.), *Eingebettet ins Menschsein: Beispiel Religion* (pp. 69–87). Lengerich, Germany: Papst.

Dittmann-Kohli, F. (1990). Sinngebung im Alter. In P. Mayring & W. Saup (Eds.), *Entwicklungsprozesse im Alter* (pp. 145–166). Stuttgart, Germany: Kohlhammer.

Donnelly, T., Matsuba, M. K., Hart, D., & Atkins, R. (2005). The relationship between spiritual development and civic development. In E. C. Roehlkepartain, P. E. King, L. M. Wagener, & P. L. Benson (Eds.), *Handbook of spiritual development in childhood and adolescence* (pp. 239–251). Thousand Oaks, CA: Sage.

Dowling, E., Gestsdottir, S., Anderson, P., von Eye, A., Almerigi, J., & Lerner, R. (2004). Structural relations among spirituality, religiosity, and thriving in adolescence. *Applied Developmental Science, 8 (1),* 7–16.

Dulles, A. (1994). *Models of revelation.* Maryknoll, NY: Orbis Books.

Durkheim, E. (1995). Elementary forms of the religious life (Karen E. Fields, Trans.). New York: Free Press. (Original work published 1915)

Elkind, D. (1961). The child's conception of his religious denomination: Vol. 1. The Jewish child. *Journal of Genetic Psychology, 99,* 209–225.

Elkind, D. (1962). The child's conception of his religious denomination: Vol. 2. The Catholic child. *Journal of Genetic Psychology, 101,* 185–193.

Elkind, D. (1963). The child's conception of his religious denomination: Vol. 3. The Protestant child. *Journal of Genetic Psychology, 103,* 291–304.

Elkind, D. (1964). Piaget's semiclinical interview and the Study of the Spontaneous Religion. *Journal for the Scientific Study of Religion, 4,* 40–46.

Ellis, A. (1980). Psychotherapy and atheistic values: A response to A. E. Bergin's "Psychotherapy and religion values." *Journal of Consulting and Clinical Psychology, 48,* 639–653.

Ellison, C. G., & Sherkat, D. E. (1993). Obedience and autonomy: Religion and parental values reconsidered. *Journal for the Scientific Study of Religion, 32,* 313–329.

Erickson, J. A. (1992). Adolescent religious development and commitment: A structural equation model of the role of family, peer group, and educational influences. *Journal for the Scientific Study of Religion, 31*(2), 131–152.

Erikson, E. (1958). *Young man Luther: A study in psychoanalysis and history.* New York: Norton.

Faulkner, K. W. (1993). Children's understanding of death. In A. Armstrong-Daily & S. Z. Goltzer (Eds.), *Hospice Care for Children* (pp. 9–21). London: Oxford University Press.

Feldman, D. H. (1980). *Beyond universals in cognitive development.* Norwood, NJ: Ablex.

Feldman, D. H. (in press). Piaget's stages: The unfinished symphony of cognitive development. *New Ideas in Psychology.*

Feldman, J. A. (in press). *From molecules to metaphor: A neural theory of language.* Cambridge, MA: MIT Press.

Fernhout, J. W. (1986). Where is faith? Searching for the core of the cube. In C. Dykstra & S. Parks (Eds.), *Faith development and Fowler* (pp. 65–89). Birmingham, AL: Religious Education Press.

Fischer, K. W., & Bidell, T. R. (1997). Dynamic development of psychological structures in action and thought. In W. Damon (Editor-in-Chief) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 467–561). New York: Wiley.

Fischer, K. W., & Rose, S. P. (1999). Rulers, models, and nonlinear dynamics: Measurement and method in developmental research. In G. Savelsbergh, H. van der Maas, & P. van Geert (Eds.), *Nonlinear developmental processes* (pp. 197–212). Amsterdam, the Netherlands: Royal Netherlands Academy of Arts and Sciences.

Flammer, A. (1994). Mit Risiko und Ungewissheit leben: Zur psychologischen Funktionalität und Religiosität in der Entwicklung. In G. Klosinski (Ed.), *Religion als Chance oder Risiko* (pp. 20–34). Bern, Switzerland: Huber.

Flavell, J. H. (1972). An analysis of cognitive-developmental sequences. *Genetic Psychology Monographs, 86,* 279–350.

Fowler, J. (1980). *Faith and structuring of meaning.* Morristown, NJ: Silver Burdett.

Fowler, J. (1981). *Stages of faith: The psychology of human development and the quest for meaning.* New York: Harper & Row.

Francis, L. (1987a). Denominational schools and pupils' attitudes towards Christianity. *British Educational Research Journal, 12,* 145–152.

Francis, L. (1987b). The decline in attitudes towards religion among 8- to 15-year-olds. *Educational Studies, 13,* 125–134.

Freeman, N. (1980). *Strategies of representation in young children: Analysis of spatial skills and drawing processes.* London: Academic Press.

Freud, S. (1907). Obsessive actions and religious practices. In J. Strachey (Ed.), *The standard edition of the complete works of Sigmund Freud* (pp. 432–451). London: Hogarth Press and the Institute of Psychoanalysis.

Freud, S. (1923a). The ego and the id. *Standard Edition, 19,* 3–66.

Freud, S. (1923b). A seventeenth-century demonological neurosis. *Standard Edition, 19,* 67–105.

Freud, S. (1961). The future of an illusion. In J. Strachey (Ed.), *The standard edition of the complete works of Sigmund Freud* (Vol. 21, pp. 1–56). London: Hogarth Press and the Institute of Psychoanalysis.

Frielingsdorf, K. (1992). *Dämonische Gottesbilder: Ihre Entstehung, Entlarvung und Überwindung.* Mainz, Germany: Grünewald.

Gandhi, M. K. (1993). *Gandhi: An autobiography—The story of my experiments with truth.* Boston: Beacon Press.

Gartner, J. (1996). Religious commitment, mental health, and prosocial behavior: A review of the empirical literature. In E. Shafranske (Ed.), *Religion and the clinical practice of*

psychology (pp. 301–319). Washington, DC: American Psychological Association.

Gesell, A. (1977). *The child from five to ten.* New York: Norton.

Gibson, H. (1990). The relationship between social class and attitude towards Christianity among 14- and 15-year old adolescents. *Personality and Individual Differences, 11,* 631–635.

Gnos, C. (2003). *Bewältigungsverhalten, religiöses Urteil und Werthaltungen.* Unpublished master's thesis, University of Freiburg, Educational Department, Freiburg, Switzerland.

Godin, A. (1968a). *From cry to word: Contributions toward a psychology of religion.* Brussels, Belgium: Lumen Vitae Press.

Godin, A. (1968b). Genetic development and the symbolic function: Meaning and limits of the work of Goldman. *Religious Education, 63,* 439–445.

Goethe, J. W. (1974). *Faust: Erster Teil.* Frankfurt am Main, Germany: Insel.

Goldfried, J., & Miner, M. (2002, December). Quest religion and the problem of limited compassion. *Journal for the Scientific Study of Religion, 41,* 685–695.

Goldman, R. (1964). *Religious thinking from childhood to adolescence.* New York: Seabury.

Gottlieb, A. (2005). Non-western approaches to spiritual development among infants and young children. In P. L. Benson, P. E. King, L. M. Wagener, & E. C. Roehlkepartain (Ed.), *The handbook of spiritual development in childhood and adolescence* (pp. 150–162). Thousand Oaks, CA: Sage.

Gould, S. J. (2003a). *Ontogeny and phylogeny.* Cambridge, MA: Harvard University Press.

Gould, S. J. (2003b). *The hedgehog, the fox, and the magister's pox: Mending the gap between science and the humanities.* New York: Harmony Books.

Grangvist, P. (1998). Religiousness and perceived childhood attachment: On the question of compensation or correspondence. *Journal for the Scientific Study of Religion, 37,* 350–367.

Greve, W., & Roos, J. (1996). *Der Untergang des Ödipuskomplexes: Argumente gegen einen Mythos.* Bern, Switzerland: Huber.

Gut, U. (1984). *Analyse der vorraussetzungen der stufen des moralischen und des reliosen urteils.* Zurich, Switzerland: Benzinger.

Hall, G. S. (1900). The religious content of the child-mind. In I. N. M. Butler (Ed.), *Principles of religious education* (pp. 161–189). New York: Longmans, Green.

Hall, G. S. (1904). *Adolescence: Its psychology and its relation to physiology, anthropology, sociology, crime, religion, and education.* Boston: Appleton.

Hall, G. S. (1908). A glance at the phyletic background of genetic psychology. *American Journal of Psychology, 19,* 149–212.

Hall, G. S. (1923). *Life and confessions of a psychologist.* New York: D. Appleton.

Halperin, D. (Ed.). (1983). *Psychodynamic perspectives on religion, sect, and cult.* Littleton, MA: PSG.

Hanisch, H. (1996). *Die zeichnerische Entwicklung des Gottesbildes bei Kindern und Jugendlichen.* Stuttgart, Germany: Calwer.

Harms, E. (1944). The development of religious experience in children. *American Journal of Sociology, 50,* 112–122.

Harris, P. L. (2000). On not falling down to earth: Children's metaphysical questions. In K. S. Rosengren, C. N. Johnson, & P. L. Harris (Eds.), *Imagining the impossible: Magical, scientific, and religious thinking in children* (pp. 157–178). Cambridge, England: Cambridge University Press.

Harris, P. L. (2003). Les dieux, les ancêtres et les enfants [Gods, ancestors and children]. *Terrain, 40,* 81–98.

Hart, T. (2005). Spiritual experiences and capacities of children and youth. In P. L. Benson, P. E. King, L. M. Wagener, & E. C. Roehlkepartain (Eds.), *The handbook of spiritual development in childhood and adolescence* (pp. 163–178). Thousand Oaks, CA: Sage.

Hartshorne, H., & May, M. A. (1928). *Studies in the nature of character: Vol. 1. Studies in deceit.* New York: Macmillan.

Hay, D., & Nye, R. (1998). *The spirit of the child.* London: Fount.

Helsper, W. (1992). *Okkultismus, die neue Jugendreligion? Die Symbolik des Todes und des Bösen in der Jugendkultur.* Opladen, Germany: Leske & Budrich.

Herzbrun, M. (1993). Father-adolescent religious consensus in the Jewish community: A preliminary report. *Journal for the Scientific Study of Religion, 32,* 163–166.

Hill, P. C. (2000). Conceptualizing religion and spirituality: Points of commonality, points of departure. *Journal for the Theory of Social Behavior, 30,* 51–77.

Hitschmann, E. (1947). New varieties of religious experience: From William James to Sigmund Freud. In G. Roheim (Ed.), *Psychoanalysis and the social sciences* (pp. 195–233). New York: International Universities Press.

Hoge, D., & Petrillo, D. (1978). Development of religious thinking in adolescence. *Journal for the Scientific Study of Religion, 17,* 139–154.

Hoge, D., & Petrillo, D. (1982). Transmission of religious and social values from parents to teenage children. *Journal of Marriage and the Family, 44,* 569–580.

Hood, R. W. (1992). Sin and guilt in faith traditions: Issues of self-esteem. In J. Schumaker (Ed.), *Religion and Mental Health* (pp. 110–121). New York: Oxford University Press.

Hood, R. (Ed.). (1995). *Handbook of religious experience.* Birmingham, AL: Religious Education Press.

Hood, R., Spilka, B., Hunsberger, B., & Gorsuch, R. (1996). *The psychology of religion: An empirical approach.* New York: Guilford Press.

Hunsberger, B. (1995). Religion and prejudice: The role of religious fundamentalism, quest, and right-wing authoritarianism. *Journal of Social Issues, 51,* 113–129.

Hunsberger, B., & Brown, L. B. (1984). Religious socialization, apostasy, and the impact of family background. *Journal for the Scientific Study of Religion, 23,* 239–251.

Hunsberger, L. (1980). A re-examination of the antecedents of apostasy. *Review of Religious Research, 25,* 21–38.

Huntington, S. P. (1996). *The clash of civilsations.* New York: Simon & Schuster.

Huntington, S. P. (1998). *Kampf der Kulturen: Die Neugestaltung der Weltpolitik im 21—Jahrhundert.* München, Germany: Siedler.

Huxel, K. (2000). *Die empirische Psychologie des Glaubens: Historische und systematische Studien zu den Pionieren der Religionspsychologie.* Stuttgart, Germany: Kohlhammer.

Hyde, K. (1965). *Religious learning in adolescence.* Edinburgh, Scotland: Oliver & Boyd.

Hyde, K. (1990). *Religion in childhood and adolescence.* Birmingham, AL: Religious Education Press.

Idler, E. (1994). *Cohesiveness and coherence: Religion and the health of the elderly.* New York: Taylor & Frances.

James, W. (1902). *The varieties of religious experience.* New York: Longmans, Green.

James, W. (1961). *The principles of psychology* (Rev. ed.). New York: Holt. (Original work published 1892)

Jarvis, G., & Northcott, H. (1987). Religion and differences in morbidity and mortality. *Social Science and Medicine, 25,* 813–824.

Johnson, C. N., & Boyatzis, C. J. (2005). Cognitive-cultural foundations of spiritual development. In E. C. Roehlkepartain, P. E. King, L. M. Wagener, & P. L. Benson (Eds.), *The handbook of spiritual development in childhood and adolescence* (pp. 211–223). Thousand Oaks, CA: Sage.

Jörns, K. P. (1997). *Die neuen Gesichter Gottes: Was die Menschen heute wirklich glauben.* München, Germany: Beck.

Jung, C. G. (1968). Concerning the archetypes, with special reference to the anima concept. In M. F. H. Read & G. Adler (Eds.), *The collected works of C. G. Jung* (2nd ed., Vol. 9, pp. 54–72). Princeton, NJ: Princeton University Press.

Kager, A. (1995). *Die Stufen des religiösen Urteils in Ordensgemeinschaften.* Eine Pilotstudie: Unveröffentliche Magisterarbeit an der Universität Wien.

Kaplan, B. (1983a). Genetic-dramatism: Old wine in new bottles. In S. Wapner & B. Kaplan (Eds.), *Toward a holistic developmental psychology* (pp. 53–74). Hillsdale, NJ: Erlbaum.

Kaplan, B. (1983b). Reflections on culture and personality from the perspective of genetic-dramatism. In S. Wapner & B. Kaplan (Eds.), *Toward holistic developmental psychology* (pp. 95–110). Hillsdale, NJ: Erlbaum.

Kimball, C. (2002). *When religion becomes evil.* San Francisco: Harper & Row.

King, P. E. (2003). Religion and identity: The role of ideological, social, and spiritual contexts. *Applied Developmental Science, 7,* 196–203.

King, P. E., & Boyatzis, C. (2004). Exploring adolescent spiritual and religious development: Current and future theoretical and empirical perspectives. *Applied Developmental Science, 8*(1), 2–6.

King, P. E., & Furrow, J. L. (2004). Religion as a resource for positive youth development: Religion, social capital, and moral outcomes. *Developmental Psychology, 40*(5), 703–713.

Kingdom, D., Siddle, R., & Rathod, S. (2001). Spirituality, psychosis, and the development of "normalising rationales." In I. Clarke (Ed.), *Psychosis and spirituality* (pp. 177–198). London: Whurr.

Kirkpatrick, L. (1995). Attachment theory and religious experience. In I. R. W. Hood (Ed.), *Handbook of religious experience* (pp. 446–475). Birmingham, AL: Religious Education Press.

Kirkpatrick, L. (1997). A longitudinal study of changes in religious belief and behavior as a function of individual differences in adult attachment style. *Journal for the Scientific Study of Religion, 36,* 207–217.

Kirkpatrick, L., & Shaver, P. (1990). Attachment theory and religion: Childhood attachments, religious beliefs, and conversion. *Journal for the Scientific Study of Religion, 29,* 315–334.

Klaghofer, R., & Oser, F. (1987). Dimensionen und Erfassung des religisen Familienklimas. *Unterrichtswissenschaft, 15,* 190–206.

Klepsch, M., & Logie, L. (1982). *Children draw and tell.* New York: Brunner/Mazel.

Klosinski, G. (1996). *Psychokulte: Was Sekten für Jugendliche so attraktiv macht.* München, Germany: Beck.

Koenig, H. (1992). Religion and mental health in later life. In J. F. Schumaker (Ed.), *Religion and mental health* (pp. 155–174). New York: Oxford University Press.

Koenig, H. G. (1994). *Aging and God: Spiritual pathways to mental health in midlife and later years.* New York: Haworth Pastoral Press.

Koenig, H., George, L., & Siegler, I. (1988). The use of religion and other emotion-regulating coping strategies among older adults. *Gerontologist, 28,* 303–310.

Kohlberg, L. (1981). *Essays on moral development: Vol. 1. The philosophy of moral development.* San Francisco: Harper & Row.

Kohlberg, L., & Power, C. (1981). Moral development, religious thinking, and the question of a seventh stage. *Zygon, 16,* 203–258.

Kroh, O. (1965). *Entwicklungspsychologie des Grundschulkindes.* Weinheim, Germany: Beltz.

Kuner, W. (1981, September). Jugendsekten: Ein Sammelbecken für Verrückte? *Psychologie Heute, 8,* 53–61.

Kushner, H. (1981). *When bad things happen to good people.* New York: Avon Books.

Kwilecki, S. (1999). *Becoming religious.* Cranbury, NJ: Associated University Press.

Lademann-Priemer, G. (1998). *Warum faszinieren Sekten? Psychologische Aspekte des Relgionsmissbrauchs.* München, Germany: Claudius.

Lambert, W., Triandis, L., & Wolf, M. (1959). Some correlates of beliefs in malevolence and benevolence of supernatural beings: A cross-societal study. *Journal of Abnormal and Social Psychology, 58,* 162–169.

Langdon, A. (1969). A critical examination of Dr. Goldman's research study on religious thinking from childhood to adolescence. *Journal of Christian Education, 12,* 37–63.

Larson, D. B., Thielman, S. B., Greenwold, M. A., Lyons, J. S., Post, S. G., Sherrill, K. A., et al. (1993). Religious content in the *DSM-III-R* glossary of technical terms. *American Journal of Psychiatry, 150*(12), 1884–1885.

Lerner, R. (2002). *Concepts and theories of human development* (3rd ed.). Mahwah, NJ: Erlbaum.

Lerner, R., Dowling, E., & Anderson, P. (2003). Positive youth development: Thriving as the basis of personhood and civil society. *Applied Developmental Science, 7*(3), 172–180.

Leuba, J. (1912). *A psychological study of religion.* New York: Macmillan.

Levin, J. S. (1997). Religious research in gerontology, 1980–1994: A systematic review. *Journal of Religious Gerontology, 10,* 3–31.

Lindenthal, J. J., Myers, J. K., Pepper, M. P., & Stern, M. S. (1970). Mental status and religious behavior. *Journal for the Scientific Study of Religion, 9*(2), 143–149.

Long, D., Elkind, D., & Spilka, B. (1967). The child's conception of prayer. *Journal for the Scientific Study of Religion, 6,* 101–109.

Maslow, A. H. (1971). *The farther reaches of human behavior.* New York: Viking.

May, A. (1997). Psychopathology and religion in the era of "enlightened science": A case report. *European Journal of Psychiatry, 11*(1), 14–20.

McFadden, S. H. (1996). Religion and spirituality. In J. E. Birren (Ed.), *Encyclopedia of Gerontology* (Vol. 2, pp. 387–397). San Diego, CA: Academic Press.

Meadow, M. J. (1992). Personality maturity and Teresa's interior castle. *Pastoral Psychology, 40*(5), 293–302.

Meadow, M. J., & Kahoe, R. D. (1984). *Psychology of religion: Religion in individual lives.* New York: Harper & Row.

Meissner, W. W. (1984). *Psychoanalysis and religious experience.* New Haven, CT: Yale University Press.

Miller, W. R., & Martin, J. E. (1988). Spirituality and behavioral psychology: Toward integration. In W. R. Miller & J. E. Martin (Eds.), *Behavior therapy and religion: Integrating spiritual and behavioral approaches to change* (pp. 13–23). Newbury Park, CA: Sage.

Murphy, R. J. L. (1978). A new approach to the Study of the Development of Religious Thinking in Children. *Educational Studies, 4,* 19–22.

Niggli, A. (1988). *Familie und religiöse Erziehung in unserer Zeit: Eine empirische Studie über elterliche Erziehungspraktiken und religiöse Merkmale bei Erzogenen.* Frankfurt, Germany: Lang.

Nipkow, K. E., Schweitzer, F., & Fowler, J. W. (1988). *Glaubensentwicklung und Erziehung.* Gütersloh, Germany: Gerd Mohn.

Nobiling, E. (1929). Der Gottesgedanke bei Kindern und Jugendlichen. In W. Gruehn (Ed.), *Atrchiv für Religionspsychologie und Seelenführung* (Vol. 4, pp. 43–216). Leipzig, Germany: Eduard Pfeiffer.

Nunn, C. Z. (1964). Child-control through a "coalition with God." *Child Development, 34,* 417–432.

Nye, R. (1999). Relational consciousness and the spiritual lives of children: Convergence with children's theory of mind. In H. Reich, F. K. Oser, & W. G. Scarlett (Eds.), *Psychological studies on spiritual and religious development* (pp. 57–82). Lengerich, Germany: Pabst Science.

Nye, W. C., & Carlson, J. S. (1984). The development of the concept of God in children. *Journal of Genetic Psychology, 145,* 137–142.

Oerter, R. (1980). *Moderne Entwicklungspsychologie.* Donauwörth, Germany: Auer.

Ohlig, K. H. (2002). *Religion in der Geschichte der Menschheit: Die Entwicklung des religiösen Bewusstseins.* Darmstadt, Germany: Wissenschaftliche Buchgesellschaft.

Oman, D., Kurata, J. H., Strawbridge, W. J., Cohen, R. D. (2002). Religious attendance and cause of death over 31 years. *International Journal of Psychiatry in Medicine, 32,* 69–89.

Oser, F. (1988a). Genese und Logik der Entwicklung des religiösen Bewusstseins: Eine Entgegnung auf Kritiken. In K. E. Nipkow, F. Schweitzer, & J. W. Fowler (Eds.), *Glaubensentwicklung und Erziehung* (pp. 48–88). Gütersloh, Germany: Güterloher Verlagshaus Gerd Mohn.

Oser, F. (1988b). Wieviel Religion braucht der Mensch? Erziehung und Entwicklung zur religiösen Autonomie. Gütersloh, Germany: Güterloher Verlagshaus Gerd Mohn.

Oser, F. (1991). The development of religious judgment. In F. Oser & W. G. Scarlett (Eds.), *Religious development in childhood and adolescence* (pp. 5–26). San Francisco: Jossey-Bass.

Oser, F. (2002). Mystische und psychologische Stufen der religiösen Entwicklung: Inkompatibel, analog, ergänzungsbedürftig? Ein spekulativer Vergleich. In W. Simon (Ed.), *Meditatio* (pp. 67–80). FS für Günter Stachel, Münster, Germany: Lit-Verlag.

Oser, F., & Gmünder, P. (1991). *Religious judgement: A developmental approach.* Birmingham, AL: Religious Education Press.

Osmer, R. R., & Schweitzer, F. (2003). *Religious education between modernization and globalization: New perspectives on the United States and Germany.* Grand Rapids, MI: Eerdmans.

Ozarak, E. (1989). Social and cognitive influences on the development of religious beliefs and commitment in adolescence. *Journal for the Scientific Study of Religion, 28,* 448–463.

Pargament, K. I. (1997). *The psychology of religious coping: Theory, research, practice.* New York: Guilford Press.

Pargament, K., & Brant, C. (1998). Religion and coping. In H. Koenig (Ed.), *Handbook of religion and mental health* (pp. 112–129). Boston: Academic Press.

Pargament, K. I., Ensing, D. S., & Falgout, K. (1990). God help me: Religious coping effects as predictors of the outcomes of significant negative life events. *American Journal of Community and Psychology, 18,* 793–824.

Pascual-Leone, J. (1983). Growing into human maturity: Toward a metasubjective theory of adulthood stages. In P. B. Baltes & O. G. J. Brim (Eds.), *Life-span development and behavior* (Vol.5, pp. 117–156). New York: Academic Press.

Pfeiffer, J. E. (1992). The psychological framing of cults: Schematic representations and cult evaluations. *Journal of Applied Social Psychology, 22,* 531–544.

Pfister, O. (1911). Hysterie und Mystik bei Margaretha Ebner (1291–1351). *Zentralblatt für Psychoanalyse und Psychotherapie, 1,* 468–485.

Pfister, O. (1925). *Die Frömmigkeit des Grafen Ludwig von Zinzendorf: Eine psychoanalytische Studie.* Zweite verbesserte Auflage, Leipzig, Germany und Wien: Franz Deuticke.

Piaget, J. (1928). Immanence et transcendence. In J. Piaget & J. de la Harpe (Eds.), *Deux types d'attitude religieuse: Immanance et transcendence* (pp. 5–40). Editions de L'Association Chretienne dE'-tudiants de Suisse Romande, Depot, Geneva, Switzerland: Labor.

Piaget, J. (1929). *The child's conception of the world.* New York: Harcourt.

Pitts, V. P. (1977). Drawing pictures of God. *Learning for Living, 16,* 123–131.

Plante, T. G., & Bovccaccini, M. T. (1997). The Santa Clara strength of religious faith questionnaire. *Pastoral Psychology, 45,* 375–387.

Plante, T. G., & Sherman, A. (Eds.). (2001). *Faith and health: Psychological perspectives.* New York: Guilford Press.

Pnevmatikos, D. (2002). Conceptual changes in religious concepts of elementary schoolchildren: The case of the house where God lives. *Educational Psychology, 22,* 93–112.

Pollner, M. (1989). Divine relations, social relations, and well being. *Journal of Health and Social Behaviour, 30,* 92–104.

Potvin, R. H., & Sloane, D. M. (1985). Parental control, age, and religious practice. *Review of Religious Research, 27,* 3–14.

Powell, L. H., Shahabi, L., & Thoresen, C. E. (2003). Religion and spirituality: Linkages to physical health. *American Psychologist, 58,* 36–52.

Pratt, J. B. (1910). An empirical study of prayer. *American Journal of Religious Psychology and Education, 4,* 48–67.

Prell, R.-E. (1995). Reflections on the social science of American Jews and its implications for Jewish education. In A. Aron, S. Lee, & S. Rossel (Eds.), *A congregation of learners: Transforming the synagogue into a learning community* (pp. 139–153). New York: URJ Press.

Pruyser, P. (1991). Forms and functions of the imagination in religion. In H. N. Maloney & B. Spilka (Eds.), *Religion in psychodynamic perspective* (p. 179). New York: Oxford University Press.

Ramachers, G. (1994). *Entwicklung und Bedingungen von Todeskonzepten bei Kindern.* Frankfurt-am-Main, Germany: Peter Lang.

Ratcliff, D. (1985). The development of children's religious concepts: Research review. *Journal of Psychology and Christianity, 1,* 35–43.

Regnerus, M., & Elder, G. H., Jr. (2003). Staying on track in school: Religious influences in high- and low-risk settings. *Journal for the Scientific Study of Religion, 42*(4), 633–649.

Reich, H. (1993). Integrating different theories: The case of religious development. *Journal of Empirical Theology, 6*(1), 39–49. (Reprinted from *The psychology of religion: Theoretical approaches,* pp. 105–113, by B. Spilka & D. M. McIntosh, Eds., 1997, Boulder, CO: Westview)

Reich, H. (1997). Do we need a theory for the religious development of women. *International Journal for the Psychology of Religion, 7,* 67–86.

Reich, H. (2004, November). *The role of cognition in religious development: The contribution of Relational and Contextual Reasoning (RCR) to religious development.* Unpublished doctoral dissertation, Universität Utrecht, Theologische Fakultät.

Reich, H. (2005). *Jean Piaget's views on religion.* Unpublished manuscript, University of Fribourg, Switzerland.

Reich, H., Oser, F. O., & Scarlett, W. G. (1999). Spiritual and religious development: Transcendence and transformations of the self. In K. H. Reich, F. O. Oser, & W. G. Scarlett (Eds.), *Psychological Studies on Spiritual and Religious Development: Vol. 2. Being human—The case of religion.* Scottsdale, AZ: Pabst Science.

Reimer, K. S., & Furrow, J. L. (2003). *A qualitative exploration of relational consciousness in Christian children.* Pasadena, CA: Fuller Theological Seminary, Graduate School of Psychology.

Rest, J. R. (1983). Morality. In P. H. Mussen (Series Ed.) & J. Flavell & E. Markman (Vol. Eds.), *Handbook of child psychology: Vol. 3. Cognitive development* (4th ed., pp. 556–629). New York: Wiley.

Richardson, J., Stewart, M., & Simmonds, R. (1979). *Organized miracles.* New Brunswick, NJ: Transaction Books.

Richardson, J. T. (1995). Clinical and personality assessment of participants in new religions. *The International Journal for the Psychology of Religion, 5,* 145–170.

Richardson, J. T., van der Lans, J., & Derks, F. (1986). Leaving and labeling: Voluntary and coerced disaffiliation from new religion movements. *Social Movement, Conflict, and Change, 8,* 385–393.

Rizzuto, A.-M. (1979). *The birth of the living God: A psychoanalytic study.* Chicago: Chicago University Press.

Roehlkepartain, E. C. (1995). *Youth development in congregations: An exploration of the potential and barriers.* Minneapolis, MN: Search Institute.

Roehlkepartain, E. C. (2005). Congregations: Unexamined crucibles for spiritual development. In E. C. Roehlkepartain, P. E. King, L. M. Wagener, & P. L. Benson (Eds.), *The handbook of spiritual development in childhood and adolescence* (pp. 324–336). Thousand Oaks, CA: Sage.

Rollett, B. (1992). *Religiöse Entwicklung und Interesse an Jugendsekten.* Forschungsbericht Universität Wien: Abteilung für Entwicklungspsychologie und Pädagogische Psychologie.

Rollett, B. (Ed.). (1996). *Religiose Entwicklung im Jugendalter.* Göttingen, Germany: Hogrefe.

Rollett, B., & Kager, A. (Eds.). (1999). *Post-modern religiousness: A prerogative of the "new religion"? Religious emotions and religious development—Finding of a pilot study.* Lengerich, Germany: Papst.

Rosenberg, R. (1989). Die Entwicklung von Gebetskonzepten. In A. Bucher & K. H. Reich (Ed.), *Entwicklung von Religiosität* (pp. 175–198). Fribourg, Germany: Universitätsverlag.

Rousseau, J. J. (1979). Emile: *Or, On Education.* New York: Basic Books. (Original work published 1762)

Salzman, L. (1953). The psychology of religious and ideological conversion. *Psychiatry, 16,* 177–187.

Scarlett, W. G. (2003 July). *Healthy and pathological spirituality.* Paper presented at the Association for Moral Education, Krakow, Poland.

Scarlett, W. G., & Perriello, L. (1991). The development of prayer in adolescence. In F. Oser & W. G. Scarlett (Eds.), *Religious development in childhood and adolescence* (pp. 63–76). San Francisco: Jossey-Bass.

Schibilsky, M. (1976). *Religiöse Erfahrung und Interaktion: Die Lebenswelt Jugendlicher Randgruppen.* Stuttgart, Germany: Kohlhammer.

Schjelderup, H., & Schjelderup, K. (1932). *Über drei Haupttypen der religiösen Erlebnisformen und ihre psychologische Grundlage.* Berlin, Germany: W. de Gruyter.

Schmidtchen, G. (1987). *Sekten und Psychokultur: Reichweite und Attraktivität von Jugendreligionen in der Bundesrepublik Deutschland.* Freiburg, Germany: Herder.

Schmitz, E., & Friebe, S. (Eds.). (1992). *Die neuen Jugendreligionen: Öffentliche Akzeptanz und Konversionsmotive.* Göttingen, Germany: Hogrefe.

Schroedter, T. (1908). Erotogenese der Religion. *Zeitschrift für Religionspsychologie: Grenzfragen der Theologie und Medizin, 1,* 445–455.

Schwartz, A. (2002). Transmitting moral wisdom in an age of the autonomous self. In W. Damon (Ed.), *Bringing in a new era in character education* (pp. 1–22). Stanford, CA: Hoover Institution Press.

Schweitzer, F. (1992). *Die Religion des Kindes: Zur Problemgeschichte einer religionspädagogischen Grundfrage.* Gütersloh, Germany: Gerd Mohn.

Scott, S., Garver, S., Richards, J., & Hathaway, W. (2003). Religious issues in diagnosis: The V-Code and beyond. *Mental Health, Religion and Culture, 6*(2), 160–173.

Shafranske, E. P. (1995). Freudian theory and religious experience. In R. W. Hood Jr. (Ed.), *Handbook of religious experience* (pp. 200–230). Birmingham, AL: Religious Education Press.

Shaver, P., Leneuaer, M., & Sadd, M. (1980). Religousness, conversion, and subjective well-being: The "healthy-minded" religion of modern American women. *American Journal of Psychiatry, 137,* 1563–1568.

Silke, A. (Ed.). (2003). *Terrorists, victims, and society: Psychological perspectives on terrorism and its consequences.* Southern Gate, England: Wiley.

Silverstein, S. M. (1988). A study of religious conversion in North America. *Genetic, Social, and General Psychology Monographs, 114,* 261–305.

Slaughter, V., Jaakola, R., & Carey, S. (1999). Constructing a coherent theory: Children's biological understanding of life and death. In M. Siegal & C. Peterson (Eds.), *Children's understanding of biology, health, and ethics* (pp. 71–96). Cambridge: Cambridge University Press.

Slee, N. (1986a). Goldman yet again: An overview and critique of his contribution to research. *British Journal of Religious Education, 8,* 33–84.

Slee, N. (1986b). A note on Goldman's methods of data analysis with special reference to scalogram analysis. *British Journal of Religious Education, 8,* 168–175.

Smith, C. (2003). Religious participation and network closure among American adolescents. *Journal for the Scientific Study of Religion, 42*(2), 259–267.

Smith, W. C. (1998a). *Faith and belief: The difference between them.* Oxford, England: Oneworld Publications.

Smith, W. C. (1998b). *Patterns of faith around the world.* Boston: Oneworld Publications.

Socha, P. (1999). The existential human situation: Spirituality as a way of coping. In H. K. Reich, F. Oser, & W. G. Scarlett (Eds.),

Psychological studies on spiritual and religious development: Vol. 2. Being human—The case of religion. Langerich, Germany: Pabst Science Publishers.

Spencer, A. E. (1971). *The future of Catholic education in England and Wales.* London: Catholic Renewal Movement.

Spilka, B., & McIntosh, D. N. (1995). Attribution theory and religious experience. In R. W. Hood Jr. (Ed.), *Handbook of religious experience: Theory and practice* (pp. 421–445). Birmingham, AL: Religious Education Press.

Stark, R. A. (1965). A taxonomy of religious experience. *Journal for the Scientific Study of Religion, 5,* 97–116.

Steele, S. (1994). The multistage paradigm and the spiritual path of John of the cross. *Journal of Transpersonal Psychology, 26,* 55–80.

Stone, M. (2000). Psychopathology: Biological and psychological correlates. *Journal of the American Academy of Psychoanalysis, 28*(2), 203–235.

Streib, H. (1999). Off-road religion? A narrative approach to fundamentalist and occult orientations. *Journal of Adolescence, 22*(2), 255–267.

Streib, H. (2001, September). *Faith development research at 20 years.* Paper presented at the 14th Conference of the International Association for the Psychology of Religion, Soesterberg, The Netherlands.

Strommen, M. P., & Hardel, R. A. (2000). *Passing on the faith: A radical new model for youth and family.* Winona, MN: Saint Mary's Press.

Tamminnen, K. (1976). Research concerning the development of religious thinking in Finnish students. *Character potential, 7,* 206–219.

Tamminnen, K. (1991). *Religious development in childhood and youth.* Helsinki, Finland: Suomalainen Tiedeakatemia.

Tamminnen, K. (1994). Comparing Oser's and Fowler's developmental stages. *Journal of Empirical Theology, 7,* 75–112.

Taylor, C. (2002). *Varieties of religion today: William James revisted.* Cambridge, MA: Harvard University Press.

Thouless, R. H., & Brown, L. B. (1964). Petitionary prayer: Belief in its appropriateness and causal efficacy among adolescent girls. *Lumen Vitae, 23,* 123–136.

Thun, T. (1959) *Die Religion des Kindes: Eine Untersuchung nach Klassengesprächen mit katholischen und evangelischen Kindern in der Grundschule.* Stuttgart, Germany: Ernst Klett.

Thurman, R. (1991). *Wisdom and compassion: The scared art of Tibet.* New York: Thames and Hundson.

Ullman, C. (1982). Cognitive and emotional antecedents of religious conversion. *Journal of Personality and Social Psychology, 43,* 183–192.

Vidal, F. (1987). Jean Piaget and the liberal Protestant tradition. In M. Ash & W. Woodward (Eds.), *Psychology in twentieth-century thought and society* (pp. 271–294). Cambridge University Press.

Vogel, P. (1936). Ein Beitrag zur Religionspsychologie des Kindes. *Archiv für die Gesamte Psychologie, 36,* 311–466.

Voss, T. (1926). Die Entwicklung der religiösen Vorstellungen. *Archiv für die Gesamte Psychologie, 57,* 1–86.

Walker, L. (2003). Morality, religion, spirituality: The value of saintliness. *Journal of Moral Education, 32*(4).

Walker, L., & Pitts, R. (1998). Naturalistic conceptions of moral maturity. *Developmental Psychology, 34,* 403–419.

Walker, L., Pitts, R., Hennig, K., & Matsuba, M. K. (1995). Reasoning about morality and real-life problems. In M. Killen & D. Hart (Eds.), *Morality in everyday life: Developmental perspectives* (pp. 371–407). Cambridge, England: Cambridge University Press.

Walker, L., & Reimer, K. S. (2005). The relationship between moral and spiritual development. In E. C. Roehlkepartain, P. E. King, L. Wagener, & P. Benson (Eds.), *The handbook of spiritual development in childhood and adolescence* (pp. 224–238). Thousand Oaks, CA: Sage.

Warwick, L. (1995). Feminist Wicca: Paths to empowerment. *Women and Therapy, 16*(2/3), 121–133.

Wenger Jindra, I. (2004). *Konversion und Stufentransformation: Ein kompliziertes Verhältnis.* Münster, Germany: Waxmann.

Wilson, E. O. (1998). *Consilience: The unity of knowledge.* New York: Alfred A. Knopf.

Wimmer, H., & Perner, J. (1983). Beliefs about beliefs: Representation and constraining function of wrong beliefs in young children's understanding of deception. *Cognition, 13,* 103–128.

Wink, P. D. M. (2002). Spiritual development across the adult life course: Findings from a longitudinal study. *Journal of Adult Development, 9*(1), 79–94.

Wittkowski, J. (1990). *Psychologie des Todes.* Darmstadt, Germany: Wissenschaftliche Buchgesellschaft.

Woolever, C., & Bruce, D. (2004). *Beyond the ordinary: 10 strengths of U.S. congregations.* Louisville, KY: Westminster/John Knox Press.

Woolley, J. (2000). The development of beliefs about direct mental-physical causality on imagination, magic, and religion. In K. S. Rosengren, C. N. Johnson, & P. L. Harris (Eds.), *Imagining the impossible: Magical, scientific, and religious thinking in children* (pp. 99–129). Cambridge, England: Cambridge University Press.

Wulff, D. M. (1991). *Psychology of religion: Classic and contemporary views.* New York: Wiley.

Wulff, D. M. (1993). On the origins and goals of religious development. *The International Journal for the Psychology of Religion, 3*(3), 181–186.

Wunderle, G. (1932). *Glaube und Glaubenszweifel moderner Jugend: Das ja und nein katholischer Schüler und Schülerinnen zur Glaubensdarbietung.* Düsseldorf, Germany: Pädagogischer Verlag.

Youniss, J., McLellan, J. A., Su, Y., & Yates, M. (1999). Religion, community service, and identity in American youth. *Journal of Adolescence, 22,* 243–253.

Yust, K.-M. (2003, June). *Challenges of faith formation in children's ministries.* Paper presented at the Children's Spirituality Conference, Christian Perspectives, Chicago, IL.

Zeligs, D. F. (1974). *Psychoanalysis and the Bible: A study in depth of seven leaders.* New York: Bloch Publishing.

Zenklusen, B. (2003). *Witwen—Erlebter Verlust durch den Tod und religiöses Urteil: Eine Untersuchung über den Zusammenhang zwischen den religiösen Stufen und dem erlebten Verlust des Ehepartners durch den Tod.* Unpublished master's thesis, University of Freiburg, Educational Department, Freiburg, Switzerland.

Zinnbauer, B. J., Pargament, K., Reye, B., Butter, M., Blavich, E., Hipp, T., et al. (1997). Religiousness and spirituality: Unfuzzing the fuzzy. *Journal for the Scientific Study of Religion, 36*(4), 549–564.

Zondag, H. J., & Belzen, J. A. (1999). Between reduction of uncertainty and reflection: The range and dynamics of religious judgment. *International Journal for the Psychology of Religion, 9,* 63–81.

Zulehner, P., Hager, I., & Polak, R. (2001). *Kehrt die Religion wieder: Religion im Leben der Menschen 1970–2000.* Ostfildern: Schwabenverlag.

Author Index

Abbott, A., 667
Abbott, R. D., 906, 925
Abbott, S., 276, 725
Abel, L., 230
Abeles, R. P., 551
Abelson, R. P., 325, 372, 522, 524, 541, 542, 543
Abraham, J. D., 591, 611, 644
Abramson, L. J., 547
Ackerman, P. L., 600, 605, 607
Acredolo, L., 54, 280, 300
Adams, G. R., 928
Adams, M. D., 7, 9, 223
Adlai-Gail, W. S., 481
Adler, M. J., 490
Adolfsson, R., 448
Adolph, K. E., 134, 246, 279
Aebli, H., 522, 532
af Klinteberg, B., 415
Agarwal, G. C., 296
Aggen, S. H., 632
Agostiani, H., 758
Aharonovich, E., 706
Ahern, F., 614
Ainsworth, M. D., 151, 153, 377, 384, 406, 422, 500, 737, 740, 815, 979
Aitken, J. K., 439
Ajzen, I., 410, 522
Akiyama, H., 696
Albersheim, L., 377
Alberts, J. A., 246
Alberts, J. R., 242
Aldwin, C. M., 635, 640, 641
Alexander, K. J., 749
Alexander, K. L., 680, 681
Alibali, M., 349, 365
Allard, T. T., 283
Allen, G. E., 222
Allen, J. J. B., 628
Allen, J. P., 919
Allen, M. J., 183
Allen, P., 178
Allen, V. L., 408, 427
Allen, W. R., 379, 835, 839, 857, 868
Allport, A., 537
Allport, G., 59, 119, 409, 432, 433, 751, 813, 947, 989
Alm, M., 415
Alm, P. O., 415
Almasy, L., 233, 239
Almazan, E. P., 704
Almerigi, J., 12, 13, 895
Alonso, J. M., 238
Alpern, L., 377
Alpert, N., 638
Alpert, R., 149
Alsaker, F. D., 412
Altaha, M., 242, 245
Altemeyer, B., 986
Altman, I., 488
Altmann, J., 507
Alvarez, J., 772
Alwin, D., 668, 688, 696
Amanatides, P. G., 223
Amann-Gainotti, M., 197
Amari, S., 300
Amato, P., 682, 691, 703
Amatruda, C. S., 132
Amaya-Williams, M., 549
Amell, J. W., 668
Ames, C., 505
Ames, L. B., 297
Ames, R. T., 753
Amick, B. C., 683
Amorim, K., 202
Anastasi, A., 33, 43, 416
Anderman, E., 503, 505, 506
Anders, T. F., 725
Andersen, C., 45, 72
Andersen, D. S., 980
Anderson, A. R., 532
Anderson, D. I., 384
Anderson, J. D., 880
Anderson, J. E., 125, 126, 130, 147
Anderson, J. R., 339, 340, 347, 606
Anderson, N. H., 605
Anderson, P., 898, 904, 915, 918, 920, 948, 971
Andersson, T., 404, 417, 445
Andreas, J. B., 335
Andresen, J., 982
Andrews, D. W., 917
Angell, J. R., 414, 415, 416
Angleitner, A., 620, 623, 633
Angoff, W. H., 417
Angold, A., 156
Anni, H., 237
Anokhin, K. V., 216, 247
Anscombe, G. E. M., 75, 76
Anthony, A., 685
Anthony, E. J., 841, 886, 887, 905
Anthony, S., 974
Antonucci, T. C., 587, 696
Apel, R., 688
Aperia, A., 424
Apfel, A., 915
Appelbaum, M. I., 30
Appley, M. H., 407
Apter, M., 469, 480

Arbreton, A. J. A., 912
Archer, S. L., 620, 622
Arcus, D., 438, 442
Ardelt, M., 607, 821
Ardila, R., 57
Arend, R. A., 501
Arendt, H., 537
Arenson, K. W., 873
Argyle, M., 945, 952, 977, 982, 983, 985
Armistead, L., 922
Armour, J. D., 876
Armstrong, K., 452
Arn, I., 416
Arnett, M., 925
Arnheim, R., 470
Aronoff, J. S., 991
Aronson, J., 834, 839, 845, 846, 870, 871
Arrington, E. G., 849
Arrington, R. E., 135
Arsenio, W. F., 25
Arterberry, M. E., 241
Arthur, M. W., 901
Aschersleben, G., 418, 436, 583, 596, 598, 599, 600, 609, 615, 616
Aseltine, R. H., 688
Asencio, M., 762
Asendorpf, J. B., 20, 623
Ash, M., 171, 185
Ashman, S. B., 416
Aslin, R., 195, 240, 605
Aspinwall, L., 416, 585, 607, 626
Assanand, S., 634
Astington, J. W., 765, 777
Astuti, R., 61
Atchley, R. C., 539, 544, 551
Atkins, R., 49, 919, 945, 984
Atkinson, J. W., 522
Atnafou, R., 919
Atran, S., 717, 729, 777, 970, 971
August, D. L., 548
Austad, S. N., 576
Austin, G., 321
Austin, J. A., 982
Austin, J. L., 523
Averill, J. A., 534, 540
Avia, M. D., 620, 633
Axel, R., 404
Axelrod, R., 624
Ayer, A. J., 73, 74
Ayoub, C., 316, 317, 321, 326, 327, 328, 334, 335, 349, 350, 357, 365, 376, 377, 378, 379, 380, 381
Azuma, H., 756, 759

Babigian, H., 427
Bach, G. R., 149
Bachman, M., 772
Bachnik, J. M., 758
Bäckman, L., 448, 548, 553, 578, 580, 593, 597, 601, 602, 609, 610, 612
Bacon, S., 624
Baddeley, A. D., 601
Bader, J. S., 237
Badley, E. M., 595
Baer, D., 150, 521
Bahrick, L., 240, 241, 243, 245, 284
Baillargeon, R., 61, 278, 303, 324, 333, 339, 340, 341, 344, 345, 353
Baird, J., 777
Bakan, D., 485
Bakeman, R., 500
Baker, R. M., 689
Bakhtin, M., 80, 200, 495, 748
Baldwin, A., 143, 146
Baldwin, B. T., 126
Baldwin, D., 287, 308
Baldwin, J. M., 2, 37, 39, 40, 60, 95, 107, 108, 109, 110, 111, 112, 113, 121, 122, 172, 187, 188, 192, 199, 247, 248, 365, 494, 495, 501, 507, 508, 683, 762
Baldwin, M. W., 762
Bales, K. R., 223
Bales, R. F., 496
Balkenius, C., 288
Balkin, J. M., 871, 872, 873, 874
Ballard, D., 287, 288, 305
Balle-Jensen, L., 725, 726, 756
Balsano, A. B., 904, 930
Baltes, B. B., 591, 594, 643
Baltes, M., 449, 527, 548, 553, 570, 576, 579, 580, 581, 582, 583, 586, 589, 590, 591, 593, 594, 597, 602, 604, 610, 611, 619, 624, 634, 635, 637, 638, 668, 671, 904
Baltes, P. B., 5, 11, 12, 167, 182, 267, 405, 408, 417, 418, 419, 421, 433, 436, 437, 441, 442, 443, 445, 448, 449, 473, 491, 493, 520, 527, 528, 530, 539, 547, 548, 551, 552, 553, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 624, 625, 626, 627, 630, 632, 634, 636, 637, 638, 639, 640, 641, 643, 644, 668, 669, 670, 671, 676, 757, 904, 915, 944
Baltes-Götz, B., 554, 578
Baltissen, R., 626, 628
Balzer, W., 531, 532
Bamberg, M., 185
Banaji, M., 315, 322, 327, 376, 379, 380, 410, 750
Banarjee, R., 771
Bandura, A., 149, 150, 151, 264, 364, 411, 424, 453, 481, 520, 522, 527, 536, 537, 539, 543, 547, 572, 587, 620, 634, 639, 811
Bane, M. J., 682, 683
Banich, M. T., 612
Banker, H., 213, 245
Banks, M. K., 420
Banks, W. C., 834
Baquedano-López, P., 744
Barbano, H. E., 637
Barbee, A. H., 574
Barber, B. L., 919
Barbu-Roth, M. A., 384
Bargh, J., 63, 522, 554, 584, 621
Bar-Joseph, Z., 237, 238
Barker, M., 135
Barker, R., 146, 421, 481, 833

Barkow, J. H., 623
Barlow, C., 223
Barnes, E., 135, 973
Barnes, H., 425, 426
Baron, H., 834
Baron-Cohen, S., 348
Barone, M., 226
Barrell, B. G., 183
Barrett, A. E., 684
Barrett, D., 987
Barrett, J., 959, 972, 975
Barrett, K. C., 321
Barrett, L. F., 370, 372
Barron, F., 484
Barsalou, L. W., 284, 303
Barth, C., 947, 974
Bartko, T., 768
Bartley, M., 683, 684, 692
Bartok, J., 376
Barton, S., 437, 582
Bartsch, K., 301
Bashore, T. R., 601
Basinger, O., 245
Basov, M., 194
Basseches, M., 495, 646
Basso, K., 745, 749
Batchelder, W. H., 774
Bates, E., 10, 279, 303, 304, 306, 356, 357, 597, 605
Bates, J. E., 498, 626, 627, 628, 629, 924
Bates, K. E., 235
Bateson, G., 145
Bateson, P., 41, 46, 156, 421
Bateson, W., 222, 235, 239
Batson, C. D., 982, 983, 984
Batterman, N., 534
Battey, J. F., Jr., 224
Bauer, D., 685, 688
Bauer, I. O., 233, 239
Baugh, J. R., 984, 985
Baughman, J. W., 698
Bauman, K. E., 920, 922
Bauman, R., 742
Baumeister, R. F., 543, 544, 549, 619, 640, 752, 753
Baumert, J., 668
Baumrind, D., 406, 425, 485, 496, 527
Bausano, M., 725
Bavelier, D., 279
Bayer, U., 540
Bayles, K., 498
Bayley, N., 134, 666
Bayley, R., 743, 744
Bean, R. A., 929
Bearer, E., 1, 7, 156, 705
Bearer, R., 416
Bearman, P., 697, 705, 920, 922
Beasley, A. B., 223
Beattie, O., 538, 541
Beatty, J., 172
Beaudet, L., 223
Beaver, A. P., 135
Becker, B., 905, 915, 916
Becker, H. S., 672, 682, 696
Beckmann, J., 522, 536, 544
Beckwith, L., 811
Bee, H., 469
Beer, R. D., 305
Beier, M. E., 605
Beile, H., 952, 963
Beilin, H., 342, 343
Beit-Hallahmi, B., 945, 948, 949, 952, 977, 991
Bekhterev, V. M., 200
Belansky, E., 922
Belfiore, P. J., 537
Belfrage, H., 415
Belknap, J. K., 223, 224
Bell, A. C., 928
Bell, D. A., 875, 877, 878
Bell, M. A., 348, 384
Bell, R. Q., 134, 406, 425, 434, 545, 623
Bell, S., 500, 846
Bellah, R. N., 755, 756
Beller, A. H., 694
Bellugi, U., 213, 214
Belnap, N. D., Jr., 532
Belsky, J., 44, 426, 500
Belzen, J. A., 964
Bem, D. J., 612, 642, 683, 692, 694
Ben-Avie, M., 913
Benedict, R., 375, 376, 728
Benes, F., 385
Benetka, G., 170
Bengtson, V. L., 551, 622, 637, 670, 697
Benigni, L., 168
Benish, G., 945
Ben-Shlomo, Y., 668
Benson, C., 750
Benson, F. B., 612
Benson, P., 12, 895, 896, 899, 900, 901, 902, 905, 906, 908, 911, 912, 913, 914, 915, 918, 920, 921, 922, 923, 924, 925, 927, 929, 930, 931, 948, 954, 971, 982
Benton, L. A., 576
Benzeval, M., 684
Bereiter, C., 349
Berg, C. A., 597, 600, 613
Berg, K., 819
Berg, M., 945
Berg, S., 614, 615
Bergeman, C. S., 819
Bergenn, V. W., 128
Berger, C. R., 525
Berglund, M. L., 896, 897, 900, 901, 916
Bergman, L. R., 5, 49, 156, 417, 420, 431, 432, 438, 442, 444, 445, 446, 447, 449, 587, 589, 611, 668, 794
Bergson, H., 177, 193, 197
Berkas, T. H., 919
Berkowitz, M. L., 981, 983
Berkowitz, W., 915, 932
Berlin, I., 717, 723, 724
Berlyne, D. E., 469, 508
Berman, J. J., 750
Berman, R., 745
Bermudez, J. L., 54
Berndt, T. J., 426
Bernheimer, L. P., 773
Bernstein, J. H., 335
Bernstein, N. A., 298
Berry, J. W., 721
Berry, T. D., 246
Bertelson, P., 240
Bertenthal, B. I., 246, 280, 302, 384
Berthier, N., 302
Berthier, W. E., 241
Berzonsky, M., 537

Betts, S. C., 928
Beuhring, T., 928
Bialystok, E., 571, 577, 596, 597, 601, 602
Bickhard, M. H., 50
Biddle, F. G., 231
Bidell, T., 154, 155, 199, 315, 319, 325, 336, 341, 342, 343, 344, 347, 365, 383, 944
Biggs, J., 323
Bigi, L., 548
Bijou, S. W., 150, 521
Binet, A., 100, 101, 102, 103, 104, 115, 118, 122, 132
Birch, H., 241
Birns, B., 143
Biro, D., 192
Birren, J. E., 491, 493, 551, 573, 576, 581, 601, 640, 646
Bishop, K. M., 225
Bishop, Y. M. M., 446
Bizzi, E., 298
Bjorklund, D., 41, 240, 600, 601, 605
Black, I. B., 215
Black, J. E., 235
Blackhart, G. C., 629
Blackmore, C., 244
Blackstone, W., 986
Blaich, C. F., 213
Blair, C., 231
Blair-Loy, M., 673
Blakeney, C. D., 964, 982
Blakeney, R. F., 964, 982
Blanchard-Fields, F., 597, 606, 620, 622, 636
Blane, D., 692
Blaney, P. H., 554
Blanton, H., 636
Blatt, S. J., 688, 753
Blavich, E., 953
Blazer, D., 540, 551, 552, 985
Bledsoe, C., 727, 736
Blehar, M., 153, 377, 384, 740, 815
Bleicher, J., 64
Blenkinsop, T. G., 320
Block, J., 6, 49, 352, 446, 450, 478, 480, 481, 530, 574, 619, 621, 639, 666, 811
Bloom, B., 530, 587
Bloom, L., 1, 24, 50
Bloom, M., 901
Blossfeld, H.-P., 589, 673
Bluck, S., 641
Blum, R. W., 914, 920, 922, 928
Blumberg, B., 289
Blumberg, H. P., 409
Blumenfeld, P., 768
Blyth, D., 12, 683, 900, 901, 905, 906, 908, 912, 913, 915, 918, 919, 920, 922, 925, 930
Bobek, D. L., 904, 930
Bock, H. H., 446
Bode, C., 620
Boehm, S. L., II, 235
Boesch, E. E., 24, 38, 49, 67, 188, 195, 199, 200, 201, 517, 519, 522, 525, 597, 717
Bogdahn, U., 609
Bogenschneider, K., 905
Bohan, J. B., 549
Bohman, M., 441
Bohner, G., 639
Boje, D. M., 485
Boklage, C. E., 232
Bolk, L., 506
Bolles, C., 423
Bolstrom, B., 906, 908, 915, 924, 928, 929
Bonanno, G. A., 621
Boncinelli, E., 410
Bond, M. H., 761
Bond, T. G., 30, 350, 351, 352
Bonilla-Silva, E., 832, 884
Bontempo, R., 753
Boomsma, D. I., 447, 613, 614
Booth, A., 677, 682, 688, 703, 913
Booth, C. L., 816
Borden, L. M., 13, 898, 900
Boring, E. G., 2, 91
Borkenau, P., 442
Borkowski, W., 362
Born, D. E., 219
Bornstein, M., 1, 4, 7, 10, 33, 36, 182, 612, 759, 779, 915
Borsboom, D., 431
Borst, S., 376
Borstlemann, L. J., 90
Bosman, E. A., 597, 605, 609
Bossom, J., 54
Bothell, D., 339, 340, 347
Bott, H., 126, 136
Botuck, S., 243
Bouchard, T. J., Jr., 226, 614, 615, 702
Boudreau, J. P., 242
Bouffard, L. A., 687
Bound, J., 689
Bourdieu, P., 195, 518, 522, 725, 732, 763, 770, 773, 775
Bourgeois, J.-P., 382, 384, 385
Bourne, L., 752, 753
Bovaird, J., 668
Bovccaccini, M. T., 982
Bowen, K. R., 605
Bowlby, J., 37, 151, 153, 265, 406, 500, 507, 815, 816
Bowman, R. E., 231
Boyatzis, C., 944, 970, 971, 976, 977, 978
Boyce, C., 837
Boyd-Franklin, N., 835
Boyer, P., 959, 970
Boykin, A. W., 835, 856, 857
Bracken, B. A., 752
Bradley, R. M., 242
Bradway, R., 589
Brainard, M. S., 244
Brainerd, C. J., 332, 333, 531
Brame, R., 688
Brammer, G. L., 415
Branchi, I., 239
Branco, A. U., 174, 176, 178, 193, 195
Brand, M., 517, 522
Brandtstädter, J., 6, 51, 411, 517, 519, 520, 524, 525, 526, 527, 528, 529, 530, 532, 534, 536, 537, 538, 539, 540, 541, 543, 545, 548, 549, 550, 551, 552, 554, 555, 570, 578, 579, 581, 582, 584, 585, 587, 593, 620, 622, 628, 634, 635, 636, 637, 638, 641, 903, 904
Brant, C., 984
Braver, T. S., 386

Brazelton, T., 499, 545, 726
Breazeal, C., 289
Bredy, T. W., 236
Brehm, J. W., 538, 544, 553, 691
Brehm, S. S., 691
Brehmer, Y., 604
Breinlinger, K., 263
Bremner, J. G., 300
Brenner, S., 233
Brent, S. B., 269, 492, 574
Brentano, C., 898, 904, 915
Brentano, E., 409
Brentano, F., 51
Bressler, R., 226
Bretherton, I., 153, 377, 500
Breuer, J., 115, 122, 380
Brewer, W. F., 102
Breytspraak, L. M., 551
Brickerhoff, M. B., 988
Brickman, P., 553
Bridgman, P., 74
Briggs, C. L., 742
Briggs, J. L., 743, 744, 772
Brim, O. G., Jr., 5, 526, 527, 539, 544, 554, 569, 571, 573, 578, 579, 582, 584, 587, 619, 622, 639, 644
Brinker, G. P., 682
Broberg, G., 432
Brody, G., 428, 696, 922
Bronfenbrenner, U., 2, 5, 10, 11, 13, 14, 44, 50, 146, 156, 177, 195, 267, 341, 349, 408, 416, 421, 427, 480, 494, 503, 525, 535, 586, 613, 668, 669, 670, 679, 702, 703, 764, 793, 794, 795, 796, 797, 799, 802, 807, 810, 814, 816, 818, 819, 821, 822, 823, 824, 833, 834, 841, 843, 846, 847, 864, 865, 866, 878, 881, 884, 900, 910, 911, 912, 918, 926
Brookins, G. K., 379, 835, 839, 857, 868
Brooks, D. R., 46, 47
Brooks-Gunn, J., 13, 154, 408, 411, 412, 430, 545, 546, 549, 682, 685, 700, 900, 901, 905, 906, 912, 916
Broughton, J., 39, 60, 90, 108, 112, 113, 494, 549
Brouwer, C., 237
Brower, A. M., 551
Brown, A. L., 317, 332, 349, 590, 605
Brown, B., 488, 895, 901
Brown, G. G., 409
Brown, G. W., 424
Brown, J., 500, 639, 777
Brown, L. B., 944, 952, 973, 974, 977, 978
Brown, T., 370
Bruce, D., 981
Brückner, H., 697, 705
Bruner, J., 153, 321, 325, 473, 494, 507, 508, 517, 519, 521, 522, 526, 530, 545, 546, 717, 741, 745, 750, 763, 911
Brunstein, J. C., 541, 639
Brunswik, E., 213, 220, 246, 421
Brush, S. G., 170
Bryant, P. E., 278
Buchanan, C. M., 429, 503
Buch-Bartos, K., 639
Bucher, A., 949, 959, 964, 973, 980, 981, 988
Buchmann, M., 680
Bucholz, K. K., 702
Buchsbaum, D., 289
Buchsbaum, H. K., 317
Buck, K. J., 223, 224
Buck, L., 404
Buckle, C. E., 227
Buckley, K. W., 130, 131, 132
Buckner, J. P., 747
Buckner, R. I., 601
Budde, M., 602, 616
Buddin, B., 365
Budwig, N., 185
Buehler, C., 922
Bühler, C., x, 129, 135, 136, 139, 147, 167, 184, 517, 521, 541, 571, 620
Bühler, K., 96, 98, 200
Bühler, R., 640
Buhrmann, K., 242
Buikhuisen, W., 410
Buitelaar, J. K., 415
Bull, J. J., 231
Bullock, D., 200, 248, 317, 318, 320, 321, 330, 332, 339, 341, 344, 351, 354, 357
Bullock, H. A., 879, 880
Bullock, M., 545, 751
Bulman-Fleming, B., 225, 230, 231
Bumbarger, B., 896, 901
Bumpass, L., 672
Bunge, M., 31, 57, 520, 528
Burgardsmeier, A., 974
Burge, B., 201
Burger, L. K., 745, 746
Burgeson, R., 683
Burgess, E. W., 698
Burgess, R. L., 647
Burkert, W., 945
Burkhart-Kasch, S., 235
Burns, B. D., 610
Burns, J., 930
Burt, C., 129, 235
Burton, L. M., 697
Burton, R. V., 150, 157
Busch, V., 609
Busch-Rossnagel, N. A., 6, 14, 316, 492, 517, 528, 635, 798
Bush, K. R., 929
Bushnell, E., 241, 242, 282
Bushway, S., 688
Busnel, M. C., 232
Buss, A. H., 537, 648
Buss, D. M., 7, 41, 623
Butchart, R. E., 880
Butler, S. C., 302
Butter, M., 953
Butterworth, G., 545
Buunk, B. P., 640
Bynner, J., 682, 692
Byrd, M., 600
Byrne, M. D., 339, 340, 347
Byrnes, J., 12

Cabeza, R., 597, 602, 603, 616, 627
Cabral, E. A., 195
Cacioppo, J. T., 628, 629, 630
Cahan, E. D., 91, 108, 109, 113, 119, 120, 741
Cain, C., 745, 748, 749

Cairns, B., 154, 155, 406, 419, 426, 427, 433, 436, 441, 447, 683, 688, 794, 925
Cairns, R., 3, 6, 49, 90, 94, 99, 108, 109, 111, 114, 132, 151, 152, 154, 155, 156, 171, 176, 185, 197, 202, 213, 214, 219, 230, 240, 249, 316, 347, 405, 406, 408, 414, 415, 416, 417, 419, 426, 427, 432, 433, 436, 439, 440, 441, 447, 482, 521, 679, 683, 688, 701, 794, 991
Calamandrei, G., 216, 247
Caldwell, J. A., 981, 983
Callan, P., 340
Calverley, R., 381
Calvert, G., 240
Calvin, J., 946
Camburn, D., 668
Cameron, A. M., 547
Cameron, J., 772
Camic, C., 733
Campbell, B. H., 537
Campbell, D. T., 13, 349
Campbell, J. D., 150, 157, 633
Campbell, J. H., 247
Campos, J., 24, 25, 246, 280, 302, 321, 384
Camras, L. A., 372
Cannon, W. B., 416
Cantor, N., 541, 544, 545, 549, 551, 620, 636, 639, 751
Cantwell, D., 989
Cao, H. T., 845, 867
Caplan, G., 901
Caplovitz, D., 978
Capps, L., 745, 747, 748
Caprara, G. V., 438
Capriotti, R., 627, 629
Capron, C., 232
Carbonari, J. P., 641
Cardon, L. R., 612, 614
Care, N. S., 522
Carey, S., 61, 302, 338, 344, 345, 364, 372, 532, 777, 975
Carlier, M., 213, 220, 227, 228
Carlo, G., 633
Carlson, J. S., 603, 973
Carlson, M., 415, 437, 913, 914
Carlson, R., 441
Carlson, S. M., 741
Carlson, V., 762
Carlton-Ford, S., 683
Carmichael, L., xi, xii, xiv, 90, 142, 147
Carnochan, P., 320, 325, 370, 371, 372
Caron, A. J., 470
Caron, R. F., 470
Carpendale, J. I. M., 63, 67, 68
Carpenter, P. A., 601
Carpenter, W. B., 93
Carr, L., 706
Carriger, M. S., 613
Carrithers, M., 753
Carroll, G., 867
Carroll, J. B., 127, 132
Carroll, V., 736
Carstensen, L., 551, 553, 570, 579, 580, 591, 620, 629, 630, 639
Carus, F. A., 527, 571
Carvalho, A. A., 202
Carver, C. S., 410, 522, 536, 537, 539, 540, 541, 543, 554, 620, 638, 639
Carver, L. J., 416
Casaer, P., 449
Case, R., 187, 199, 323, 333, 342, 343, 344, 348, 350, 353, 357, 368, 369, 384, 545, 549, 601, 602, 944
Caspi, A., 233, 408, 415, 428, 429, 431, 434, 571, 613, 620, 621, 622, 623, 625, 628, 633, 642, 668, 679, 683, 684, 685, 688, 691, 692, 694, 695, 696, 703, 705, 813
Cassidy, E., 833, 846, 856, 859, 860, 861, 862, 870
Cassidy, J., 377
Cassirer, E., 58, 59, 956, 988
Castenell, L. A., Jr., 842, 857
Castiglione, C. M., 227
Catalano, R. F., 896, 897, 900, 901, 906, 915, 916, 923, 925
Cattell, A. K. S., 446
Cattell, J., 102
Cattell, R. B., 446, 583, 596, 600, 605, 613, 618, 622, 627
Catterall, J. S., 920
Caudill, W., 725, 726, 739, 756, 758, 759
Cavilli-Sforza, L., 977
Cazden, C. B., 748
Ceci, S. J., 408, 586, 614, 679, 702, 703, 799, 807, 819, 821, 822, 823, 824, 864, 865, 866, 889
Celniker, S. E., 223
Cerbone, F. G., 688
Cerella, J., 601
Cervantes, C. A., 744
Cervone, D., 455, 619, 620, 640
Challman, R. C., 136
Chalmers, D., 466
Champagne, D. L., 236
Chan, A., 373, 374, 815
Chandler, M., 27, 61, 269, 492
Chang, C. F., 835
Chang, H., 683
Changeux, J.-P., 219
Chao, R. K., 759, 760
Chapman, M., 61, 188, 197, 198, 343, 517, 547, 601, 606
Charles, N., 831
Charles, S. T., 579, 620, 630, 639
Charlesworth, B., 575
Charlesworth, W. R., 94
Charness, N., 367, 597, 606, 610
Chartrand, T. L., 554
Chase, W. G., 610
Chassein, B., 539
Chaudhary, N., 168, 200
Chaudhuri, A., 237
Chaudhuri, J., 12
Cheadle, J., 691
Cheek, P. R., 553
Chen, A., 223
Chen, E. C., 748
Chen, H. M., 238
Chen, L., 775
Cheng, C., 332, 354, 356
Cheng, M.-F., 216
Cheng, P. C.-H., 605, 609
Cherif, C., 227, 228
Cherlin, A. J., 682
Chernoff, J. M., 184
Cherny, S. S., 613
Chesler, E. J., 235
Chess, S., 477, 491, 493, 526, 623, 905

Chestang, L. W., 834, 839, 845, 870, 871, 872, 873
Cheung, T. S., 761
Chi, M. T., 263, 582, 606, 776
Chiara, G., 640
Child, I., 719, 725, 732
Chin, H. R., 224
Chinen, A. B., 491
Chisholm, R. M., 523
Chomsky, N., 61, 303, 315, 338, 339, 340, 344, 346
Christou, C., 343, 353
Chu, A. M., 238
Chudacoff, H. P., 524
Chugani, H. T., 602
Church, M. A., 639
Church, R. B., 365
Churchill, J. D., 420
Churchland, P., 282, 303
Cianciolo, A. T., 607
Cicchetti, D., 156, 248, 317, 377, 578, 637, 835, 905, 915, 916
Cicero, M. T., 572
Clancy, P., 744
Clark, C. D., 721, 741
Clark, C. L., 377
Clark, G. N., 500
Clark, H., 767
Clark, J. E., 196
Clark, K. B., 378, 871
Clark, M. K., 378
Clark, M. P., 871
Clarke, A. D. B., 527
Clarke, A. M., 527
Clarke, P., 701
Clarke-Stewart, K. A., 530
Clark-Kauffman, E., 689
Clausen, J. A., 574, 666, 669, 687, 693
Clayton, V. P., 491, 493
Clifton, R., 241, 302
Clingempeel, W. G., 808, 816
Clipp, E. C., 698, 821
Cloninger, C. R., 441, 620, 629
Clyman, R. B., 317
Coats, E. J., 604, 639
Coatsworth, J. D., 905
Cochran, D. L., 762
Cochrane, C., 231
Cocking, R., 542, 751, 752, 755, 758
Coelho, N. E., Jr., 199
Cohen, D., 156, 637, 717, 723
Cohen, J. D., 601
Cohen, L. B., 278, 470
Cohen, M. R., 19
Cohen, N. H., 261
Cohen, N. J., 236, 612
Cohen, R. D., 982
Cohen, R. L., 688, 696
Cohen, S. E., 500, 587, 811
Cohen, S. H., 587
Cohler, B. J., 811
Coie, J. D., 427
Colby, A., 5, 156, 348, 449, 668, 718, 722, 983
Colcombe, S., 604, 612
Cole, E., 276
Cole, M., 31, 66, 153, 200, 322, 347, 356, 522, 531, 576, 586, 597, 644, 717, 718, 723, 725, 738, 742, 751, 762, 765, 766, 770, 772, 778, 794, 859, 869
Coleman, H. L., 835
Coleman, J. C., 538, 543
Coleman, J. S., 401, 410, 421, 913
Coles, R., 748, 968
Coley, J. D., 717, 729, 777
Coll, C. G., 705
Collingwood, R. G., 732
Collins, L. M., 446, 668, 685
Collins, P. F., 628, 629
Collins, R. L., 225, 539
Collins, S., 753
Collins, W. A., 1, 7, 10, 33, 36, 535, 550, 580, 915
Collis, K., 323
Columbus, R., 244
Colvin, C. R., 622, 639
Comer, J., 913
Commons, M. L., 323
Compayré, G., 96, 98
Condon, S. M., 496
Condorcet, J. A., 944
Conger, K. J., 924
Conger, R. D., 428, 685, 688, 692, 696, 821, 924
Connell, J. P., 548, 635, 906, 911, 913, 914, 915, 924, 927, 932
Connell, M. W., 366
Connelly, C., 238
Connolly, J. A., 811
Connolly, K. J., 167, 405
Conrad, H., 598
Conrad, T., 385
Conway, A. R. A., 602
Cook, G., 190
Cook, M., 293
Cook, T. D., 683, 697, 924
Cooke, J., 260
Cookson, K., 28, 62
Cooley, C. H., 111, 113, 485, 501
Cooley, D. H., 762
Coons, H., 424
Cooper, B. P., 604
Cooper, C. R., 496, 771, 772, 773, 774
Cooper, H., 926
Cooper, R., 881
Coopersmith, S. A., 753
Copeland, P., 624
Coppotelli, H., 427
Corbetta, D., 286, 293, 294, 295, 296, 297
Corbit, J. D., 423
Corcos, D. M., 296
Corey, L. A., 819
Cornelius, S. W., 448, 539, 586, 611, 676
Cornford, F. M., 56
Cornoni-Huntley, J., 637
Corrigan, R., 332
Corsaro, W. A., 721, 741, 743, 745, 748, 770
Cortés, D. E., 762
Cosmides, L., 41, 623
Costa, F. M., 901, 921, 923
Costa, P. T., Jr., 378, 488, 619, 620, 621, 632, 633, 635, 637
Costall, A., 121
Costanzo, P. R., 411, 439
Costello, E. J., 347, 679
Costigan, K. A., 629
Cote, L. R., 779
Cotman, C. W., 584, 594
Cott, C., 595
Cottrell, L., Jr., 145, 150, 930
Coulombre, A. J., 142
Courtier, J., 101
Cousins, S. D., 757
Covitz, F. E., 811
Cowdry, E. V., 573

Cowen, E. L., 427
Coyle, T. R., 364
Coyne, J. C., 553
Crabbe, J. C., 223, 224, 225, 235, 239
Craig, I. W., 233
Craik, F. I. M., 571, 577, 596, 597, 601, 602
Craik, K., 500
Cranston, M., 555
Crapo, L. M., 603
Craven, R. G., 634
Crawford, C., 179
Cremin, L. A., 120
Crenshaw, K., 832, 867
Crick, F., 170, 282, 403
Crick, N. R., 25
Criqui, M. H., 638
Crits-Christoph, P., 376, 377
Crocker, J., 542, 749
Crockett, L. J., 517
Croker, S., 605, 609
Cronbach, L. J., 104, 440, 446, 574, 589
Cronon, W., 969
Croog, S., 990
Crook, C., 751
Crosby, L., 917
Crosnoe, R., 666, 691, 920
Cross, D., 301, 777
Cross, W. E., Jr., 834, 835, 842, 843, 859, 867, 871, 878, 879, 880, 881, 882, 889
Crossin, K. L., 216
Crott, H. W., 616
Crouch, C. H., 340
Crouter, A. C., 177, 416, 673, 677, 794, 799, 821, 833, 866, 913
Crowell, J. A., 377
Crowley, K., 72, 86, 364, 365, 590, 603, 605, 775
Crumbaugh, C., 769
Crusio, W. E., 238
Crutchfield, F. L., 223
Csikszentmihalyi, I. S., 477
Csikszentmihalyi, M., 184, 423, 467, 468, 469, 470, 473, 477, 478, 479, 481, 484, 491, 497, 498, 502, 504, 505, 506, 526, 538, 541, 900, 912, 918
Csordas, T. J., 49
Culver, C., 62
Cunningham, C. L., 223, 224
Cunningham, M., 831, 838, 857, 858, 859, 867, 869, 870, 881
Curnan, S. P., 898, 913
Curran, P. J., 685
Cushman, P., 764

Dabholkar, A. S., 602
Daecke, M., 945
Dahlstrom, W. G., 127
Dailey, M. E., 385
Dalton, T. C., 128
Damasio, A., 38, 48, 49, 282, 285, 370, 372, 386, 412, 415, 421, 468
Damasio, H., 421
Damon, W., 2, 6, 11, 12, 27, 38, 63, 67, 69, 73, 336, 496, 533, 550, 576, 756, 763, 845, 895, 896, 900, 901, 913, 926, 983
D'Andrade, R., 524, 576, 717, 718, 723, 768
Daner, F., 987
Daniels, M., 230, 231
Dannefer, D., 517, 519, 540, 586, 671
Danziger, K., 170
Darity, W. A., Jr., 832
Darley, J. M., 983
Darling, N. E., 817, 818
Darlington, R. B., 444
Darwin, C., 159, 401, 412, 433
Daselaar, S. M., 602, 616
Dasen, P. R., 721
Daston, L., 172
Datan, N., 586, 674
Datnow, A., 881
Dauber, S. L., 680
Davey, M., 915
Davey, T. C., 613
David, J. P., 641
Davidson, A. L., 772, 845, 867
Davidson, D., 521, 756
Davidson, P., 67, 343, 533
Davidson, R. J., 627, 628, 629, 630
Davies, D. R., 537
Davies, K. I., 746
Davis, F. C., 238
Davis, J. L., 282
Dawkins, R., 619
Dawson, G., 364, 416
Dawson, T. L., 30, 79, 323, 332, 333, 334, 350, 351, 352
Dawson-Tunik, T. L., 387
Deacon, T. W., 382
Dearing, R. L., 371
Deary, I. J., 616
de Beer, G., 93, 94, 99
DeCasper, A. J., 232
DeCharms, R., 837, 838
Deci, E. L., 755
Decker, S., 554
Deconchy, J.-P., 973
de Frias, C. M., 448
DeFries, J., 340, 347, 498, 632, 866
de Gelder, B., 240
de Geus, E. J. C., 614
Degrelle, H., 213
Dehaene, S., 342
DeKay, W. T., 623
deLeeuw, N., 263
de León, L., 743
Delgado, R., 875, 876, 877, 878
Dell, T. C., 602
Dell'Angleo, T., 831, 887
Delle Fave, A. D., 471
DelVecchio, W. F., 632
Dembo, T., 146
Demetriou, A., 26, 343, 353
Demick, J., 39, 69, 70
Dempster, F. N., 601
Dempster-McClain, D., 675
Deng, F. M., 737
Dengler, D., 377
Denner, J., 773
Dennett, D., 51, 519, 521
Denney, N. W., 590
Dennis, A., 445
Dent, C. H., 240
Denz, H., 944
Depue, R. A., 628, 629
de Ribaupierre, A., 449
Derks, F., 988
Derryberry, D., 555
Descartes, R., 56, 336, 337
De Stefanis, I., 915

Detterman, D. K., 234
Devlin, B., 230, 231
De Weerth, C., 291
Dewey, J., 68, 69, 119, 120, 195, 467, 470, 478, 497, 502, 508, 750
Diacoyanni-Tarlatis, I., 373, 374
Diamond, A., 275, 283, 302, 348, 353, 613
Dias, M., 717, 718, 738, 756
Diaz, I., 241
Diaz, R. M., 549
DiBerardino, M. A., 219
Dick, A., 54, 61, 963
Dick, D. M., 233, 239, 428, 614, 702
Dickinson, C. M., 590
Dickson, M. W., 644
Dickson, N., 695
Dickstein, S., 441
DiClemente, C. C., 641
Diedrich, F. J., 301
Diehl, M., 620, 634, 638
Diener, E., 630, 633
Diguer, L., 377
Di Loreto, O., 963, 990
Dilthey, W., 521
Dimsdale, J. E., 438
Dionne, J. P., 751
Di Paula, A., 634
DiPietro, J. A., 629
Diriwächter, R., 171, 176, 185, 195
Dishion, T., 427, 917
Dissanayake, W., 753
Dittmann-Kohli, F., 550, 591, 596, 620, 634, 639, 904, 985
Dixon, R. A., 267, 347, 436, 548, 551, 553, 569, 571, 578, 580, 582, 583, 591, 593, 596, 606, 611, 626, 632, 904
Dixon, S., 735, 737, 738, 739
Dodart, J.-C., 223
Dodd, B., 240
Dodds, A. E., 190
Dodge, K. A., 25, 335, 416, 427, 924
Doi, T., 718
Dolan, C. V., 447, 613
Dolan, R. J., 606
Dolby, R. G. A., 170
Dolcos, F., 602, 616
Dollahite, D., 977, 978
Dollard, J., 144, 149
Dominguez, E., 772
Donagan, A., 731
Donahue, E. M., 634
Donahue, M. J., 948
Donaldson, G., 417
Donde, S., 833, 846, 856, 859, 860, 861, 862
Dong, H., 255
Dong, W., 604
Donnelly, T., 945, 984
D'Onofrio, B., 614
Doob, L. W., 144, 149
Dorgan, K. A., 913, 927
Dorn, L. D., 686
Dornbusch, S., 835, 838, 842, 920
Dörner, J., 634
Dörner, O., 538
Dorow, J., 235
Dorsett, J. G., 644
Dorsey, S., 922
Douglass, S., 339, 340, 347
Doussard-Roosevelt, J. A., 628
Dowdney, L., 426
Dowling, E., 12, 895, 898, 904, 915, 918, 920, 930, 932, 948, 971
Doyle, A., 811
Drachman, D. B., 142
Draganski, B., 609
Drake, D., 12, 912, 920
Draper, P., 44
Dray, W. H., 75
Dreher, E., 550, 551
Driesch, H., 211, 218
Drillien, C. M., 799
Drobnic, S., 673
Drummond, W. B., 119
Dryfoos, J. G., 900, 901, 913
DuBois, D. L., 926
Du Bois, W. E. B., 867, 877, 880
Dubow, E. F., 925
Ducret, J.-J., 197
Dudek, B. C., 235
Duke, K., 237
Dukes, R., 920
Dulles, A., 986
Dumais, S. T., 537
Dunbar, K., 368
Duncan, G., 5, 156, 682, 683, 688, 689
Duncan, S. C., 685
Duncan, T. E., 685
Dunér, A., 425
Dunn, J., 413, 422, 738, 741, 777
Dupree, D., 831, 846, 847, 858, 859, 862, 869, 870, 905
Duran, R., 919
Duranti, A., 742
Durham, W. H., 575, 576, 580, 596, 605, 644
Durkheim, E., 944
Durkin, K., 638
Durlak, J. A., 901, 916
Durnaret, A., 232
Duster, T., 837
Duval, S., 537
Duveen, G., 201
Duyme, M., 232
Dweck, C. S., 517, 839
Dworkin, J. B., 918
Dyer, A. B., 244
Dyson, A. H., 745, 748

Eaker, D. G., 915
Eales, B. A., 231
Earls, F., 13, 415, 437, 913, 914, 926
Early, D., 922
Easterbrooks, M. A., 547
Easterlin, R. A., 676
Eaton, W. H., 698
Eaves, L., 702, 819
Ebaugh, H. R. F., 673
Ebbinghaus, H., 103, 132
Ebner, N. C., 579, 592, 631
Eccles, J. S., 12, 410, 411, 428, 429, 503, 504, 506, 683, 690, 821, 905, 917, 919, 922
Eckenhoff, M. F., 382, 384, 385
Eckensberger, L. H., 38, 67, 200, 201, 517, 526, 717
Edelman, G. M., 7, 27, 38, 46, 47, 48, 49, 216, 219, 240, 249, 260, 282, 285, 303, 410, 421, 434, 582
Edelstein, W., 343, 348, 449, 526, 579, 752, 757
Edenberg, H. J., 233, 239

Eder, R. A., 751, 757
Edey, M. A., 507, 508
Edwards, C. P., 321, 356, 364, 379, 738, 739
Edwards, J. N., 682
Edwards, L., 219, 222, 228, 249, 704
Efklides, A., 412, 413
Eggleston, E. P., 685
Eibach, R., 35
Eichorn, D. H., 345, 348, 387, 574, 666
Eilers, R., 245
Eisen, M., 751
Eisenberg, A. R., 743, 745
Eisenberg, N., 902, 928
Eisenstadt, S. N., 674
Eisner, T., 440
Ek, E. U., 777
Ekman, P., 62, 373, 374, 628, 629
Elbert, T., 609
Elbogen, E. B., 633
Elder, G. H., Jr., 4, 6, 7, 13, 90, 347, 428, 429, 438, 571, 573, 574, 586, 587, 665, 666, 667, 668, 670, 672, 674, 675, 676, 677, 678, 679, 682, 683, 685, 686, 688, 689, 691, 692, 693, 694, 696, 697, 698, 699, 700, 701, 703, 813, 821, 822, 830, 904, 971
El-Khouri, B. M., 444, 446, 447, 448, 668
Elkind, D., 958, 973, 974, 975
Ellen, J., 914
Ellias, M. F., 616
Elliot, A. J., 639
Elliott, D. S., 695
Ellis, A., 537, 986
Ellis, L. A., 634
Ellis, M. J., 508
Ellison, C. G., 978
Ellison, C. M., 835, 857
Ellwood, D. T., 682, 683
Elman, J., 10, 22, 279, 303, 306, 357, 596, 597, 605
Elson, S. E., 768, 770
Elster, J., 536, 750
Emde, R. N., 317, 422, 432, 527
Emerson, P. E., 151, 153
Emler, N., 428
Emmerich, W., 7
Emmons, R. A., 541, 631, 639
Endler, N. S., 406, 419
Eng, P., 862
Engel, B. T., 627, 629
Engel, S., 745
Engeström, Y., 765
Engle, R. W., 597, 602, 605, 609, 610
Engler, R., 187
Ennis, M., 25, 30, 52
Ensel, M., 703
Ensing, D. S., 990
Entin, E. E., 543
Entwisle, D. R., 680, 681
Ephron-Wertheim, T., 533
Eppler, M. A., 246
Epstein, D., 612
Epstein, S., 411, 549, 751
Erickson, F. D., 721, 722
Erickson, J. A., 948, 977
Erickson, K. G., 920
Erickson, K. I., 611
Erickson, M. A., 822
Ericsson, K. A., 367, 415, 553, 582, 593, 597, 605, 607, 609, 776
Erikson, E., 28, 37, 38, 60, 383, 469, 493, 508, 538, 541, 571, 579, 620, 621, 622, 625, 632, 669, 670, 750, 842, 845, 846, 850, 949
Erikson, J. M., 493
Erlenmeyer-Kimling, L., 230
Escobar, A., 171
Essed, P., 882
Essex, C., 174
Essex, M. J., 637
Estes, W. K., 146, 159, 329, 365
Evans, C. A., 223
Evans, G. W., 794, 795, 797, 822, 823
Eyferth, K., 517
Eyler Zorilla, L. T., 409
Eysenck, H. J., 415, 499

Fabes, R. A., 902, 928
Fabricius, W. V., 198
Fader, A., 744
Fagan, J. F., 613
Fagen, A. P., 340
Fagen, R. M., 508
Fairbairn, W. R. D., 60
Fajans, J., 752
Falgout, K., 990
Farber, S. L., 233
Farde, L., 601
Farmer, E. M. Z., 156
Farmer, M. E., 224
Farmer, T. W., 156, 925
Farnham, S., 315, 322, 327, 376, 379, 380
Farr, M. J., 776
Farrar, M. J., 321, 325, 333
Farrington, D. P., 695
Farver, J. M., 742, 760
Faulconer, J. E., 436
Faulkner, K. W., 974
Fawcett, P., 415
Feather, N. T., 522
Featherman, D. L., 442, 581, 589, 591
Feffer, M., 380
Fegley, S., 49, 752, 831, 846, 887
Fein, G. G., 508, 530
Feinberg, S. E., 446
Feinglos, M. N., 231
Feldlaufer, H., 504
Feldman, D. H., 956, 970
Feldman, J. A., 991
Feldman, M. W., 7
Feldman, S., 544
Felser, G., 550
Fenichel, O., 117
Fenigstein, A., 537
Fensham, P., 423
Fentress, J. C., 433, 437
Fenwick, R. G., 225
Ferber, T., 896, 900, 901, 906, 911
Féré, C., 100
Ferguson, M. W. J., 231
Ferguson, R. F., 913, 927
Fergusson, L. L., 433, 447
Ferland, M. B., 241
Fernald, A., 759
Fernandez, M., 835
Fernhout, J. W., 964
Ferrar, M. J., 199

Ferrer-Caja, E., 582
Ferri, E., 692
Feshbach, N., 902
Festinger, L., 146, 538
Fetters, L., 293
Field, T., 496, 499, 500, 501
Fiese, B. H., 441, 745
Figueiredo, L. C., 199
Filipp, S.-H., 545, 551, 620, 626, 634, 638, 640, 641, 642
Fillmore, C. J., 522
Finch, C. E., 225, 575, 576, 584, 593
Fink, R. P., 335
Finkel, D., 613
Fischbein, S., 819, 865
Fischer, K., 30, 79, 154, 155, 187, 199, 200, 213, 248, 291, 315, 316, 317, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 332, 333, 334, 335, 336, 339, 340, 341, 342, 343, 344, 347, 348, 349, 350, 351, 352, 353, 354, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 375, 376, 377, 378, 379, 380, 381, 382, 383, 385, 386, 387, 388, 389, 521, 532, 533, 944
Fischer, L., 752
Fishbein, H. D., 247
Fishbein, M., 410, 522
Fisher, C. B., 12, 156, 837, 898, 902, 905
Fisher, D. M., 275, 292
Fisher, L. M., 646
Fisk, A. D., 603
Fisk, J. E., 604
Fiske, A., 718, 729, 753, 768, 770
Fiske, D. W., 13
Fiske, J., 99
Fiske, S. T., 639
Fitch, W. T., 338
Fitts, P. M., 296
Fivush, R., 701, 745, 747
Flammer, A., 945
Flanagan, C., 429, 503
Flanagan, O., 750
Flanders, M., 296
Flannery, D. J., 929
Flash, T., 298
Flavell, E. R., 762
Flavell, J., 2, 153, 332, 335, 341, 346, 532, 548, 549, 600, 606, 762, 844, 993
Fleeson, W., 541, 620, 638, 639, 641
Fleishman, E. A., 352
Fleming, C. B., 906
Fleming, W. P., 895, 901
Fletcher, A. C., 817, 818
Flint, J., 224
Flom, R., 240, 245
Florin, P., 901, 915, 932
Flynn, J. R., 603, 611
Fodor, J., 303, 325, 339, 340, 343, 344, 368
Fogel, A., 195, 240, 362
Folkman, S., 552, 635
Folkow, B., 628
Foner, A., 573, 586, 587, 667, 668, 674, 675
Fontaine, J. R. J., 374
Ford, D. H., 11, 30, 156, 177, 179, 181, 182, 195, 196, 211, 213, 219, 228, 248, 249, 259, 267, 270, 432, 442, 446, 481, 522, 528, 622, 679, 902
Ford, D. Y., 881
Fordham, S., 835, 836, 845, 878, 879, 880, 881, 882
Forehand, R., 922
Foreman, N., 242, 245
Forest, K. B., 675
Forgas, J. P., 406, 412, 422
Forster, J. M., 641
Forsythe, A. B., 500
Foshee, V. A., 921, 928
Foss, B. M., 153
Foster, C., 552
Foster, K., 927
Foster, W., 916
Foucault, M., 775
Foulkes, D., 380
Foushee, R., 242
Fowler, J., 952, 959, 960, 964, 965, 966, 988
Fox, B. A., 498
Fox, C. M., 30, 350, 351, 352
Fox, N. A., 348, 384
Fox, N. E., 816
Fox, P. W., 613
Fraley, R. C., 373, 374, 377
Francis, L., 98
Frank, D., 837
Frank, L., 125
Frankel, C., 75
Frankel, W. N., 224, 225
Frankfurt, H. G., 525
Franks, M. M., 634
Franz, S. I., 102
Frasier, K., 922
Fravel, D. L., 441
Frazier, L. D., 636
Fredericks, L., 926, 932
Fredricks, J., 768
Fredrickson, B. L., 470, 638
Freedman, D., 499, 668
Freeman, A. D., 875
Freeman, N., 241, 973
Freeman, W. J., 273
Freeman-Moir, D. J., 60, 90, 108, 112, 494
Frese, M., 522
Freud, A., 144
Freud, S., 94, 114, 115, 116, 122, 379, 380, 508, 948, 982, 993
Freund, A., 570, 575, 576, 578, 579, 584, 585, 590, 591, 592, 593, 594, 595, 597, 601, 602, 605, 606, 608, 609, 620, 622, 630, 631, 632, 635, 636, 638, 641, 915
Frey, K. S., 640
Freyd, J., 277
Friebe, S., 987
Friedel, J., 768
Friedes, D., 241
Friedman, H. S., 623, 638, 652
Friedman, J. M., 226
Friedman, S. L., 542
Frielingsdorf, K., 973, 990
Frierson, T., 441
Fries, J. F., 603
Friesen, W. V., 373, 374, 629, 630
Frieze, I. H., 546
Frijda, N. H., 321, 370, 371, 534, 718, 766

Frith, C. D., 606
Frohring, W., 604
Frye, D., 844
Fujita, F., 633
Fukuyama, F., 900
Fuligni, A., 717, 718, 723, 767, 772
Fulker, D. W., 613, 615
Fumerton, R., 78, 79
Funder, D. C., 619
Fung, H., 551, 741, 744, 745, 746, 748, 749, 754, 759, 761
Furby, R., 589
Furlong, M., 917
Furrow, J. L., 968, 971
Furstenberg, F. F., Jr., 5, 156, 449, 668, 680, 683, 685, 686, 700, 900, 901, 908
Furth, H. G., 67
Fussell, E., 672, 686

Gabrielian, S., 333, 334
Gadamer, H. G., 58, 59, 63, 64, 65, 73, 75
Gage, F. H., 236, 420
Gaines, B., 538
Galambos, N., 408, 905
Galanter, E., 522, 536
Galitski, T., 402
Gallagher, D., 641
Gallese, V., 49, 53
Gallimore, R., 736, 773
Gallistel, C. R., 263
Galton, F., 102, 122, 437
Gambone, M. A., 906, 911, 912, 913, 914, 924, 927
Gandhi, M. K., 969
Gangestad, S., 438
Gannon-Rowley, T., 701
Garbarino, J., 900
Garcia, C. A., 225
Garcia, R., 60, 343, 532, 605
Garcia Coll, C., 1, 156, 416, 771, 772, 774
Garcia-Mila, M., 45, 72
Gardner, C. O., 705
Gardner, H., 321, 343, 367, 484, 485
Gardner, J., 243, 247, 469
Gardner, W. P., 498
Gariépy, J.-L., 219, 220, 240, 249, 433, 447, 701
Gärling, T., 526
Garmezy, N., 578, 637, 805, 902, 905, 919, 924
Garraghty, P. E., 420
Garrett, H. E., 616
Garrett, L., 223
Garrett, P. B., 744
Gartner, J., 986
Gärtner, K., 225
Garver, S., 989
Garvey, C., 139, 741
Garvik, B., 419
Garwood, M., 627, 629
Gaser, C., 609
Gaskins, S., 741
Gasser, M., 291
Gatenby, D., 289
Gatz, M., 630
Gauvain, M., 321, 765, 766
Ge, X., 428, 685, 696
Geertz, C., 518, 522, 738, 755, 763
Gegeo, D. W., 743, 744
Gehlen, A., 518, 522, 580
Geiselmann, B., 576
Gelman, R., 54, 263, 278, 333, 341, 342, 344, 345, 346, 364, 372, 778
Gelman, S. A., 343, 775, 776
Genishi, C., 745
Gentner, D., 368
George, L., 652, 689, 701, 703, 985
Geppert, U., 546
Gerard, J. M., 922
Gerber, G. K., 237, 238
Gergen, K. J., 31, 517, 527, 530, 550, 745, 750, 753
Gergen, M. M., 550
Gerlai, R., 238
Gershkoff-Stowe, L., 276, 279, 291, 292
Gershman, E. S., 427
Gerton, J., 835
Gerzén, M., 418
Gesell, A., 132, 133, 134, 297, 947
Gest, S. D., 156, 919, 924
Gestsdottir, S., 12, 13, 895
Getz, K., 379
Getzels, J., 484
Geuze, R., 449
Gewirtz, J. L., 150
Ghisletta, P., 589. 598, 606, 611, 615, 616, 617, 624
Giaever, G., 238
Gianutsos, J., 7
Gibbons, F. X., 640, 696
Gibbs, J., 348
Gibson, E. J., 241, 246, 287, 303
Gibson, H., 977
Gibson, J. J., 63, 65, 241, 246, 309, 316, 321, 518, 519, 546
Gibson, K. R., 247
Gibson, W. A., 446
Giddens, A., 526, 763
Gierer, A., 260, 261, 262
Gigerenzer, G., 171, 172, 596, 605, 623
Gignac, M. A. M., 595
Gilbert, D. T., 520, 554
Gilbert, J. A., 103
Gilbert, S. F., 46
Gilkey, L., 490
Gillespie, A., 199, 201
Gillett, G., 414
Gilligan, C., 492
Gilmore, P., 782
Gilovich, T., 35
Gimbel, C., 688
Ginzberg, S., 871
Giorgi, A., 465
Giot, L., 237
Glaser, B. G., 672
Glaser, D., 416
Glaser, R., 582, 776
Glatthorn, A. A., 782
Glei, D., 924
Gleitman, L., 282
Glenberg, A., 284, 287, 303
Glendinning, A., 429
Gleser, G. C., 446
Glotzbach, S. F., 725
Glueck, E., 699
Glueck, S., 699
Gmünder, P., 946, 952, 959, 961, 963, 964, 965, 966, 978, 980, 981, 988
Gnos, C., 964

Gobet, F., 605, 609
Gocayne, J. D., 223
Goddard, C., 722, 732
Goddard, H. H., 103, 126
Godin, A., 959, 974
Goethe, J. W., 993
Gogate, L., 284
Goldberg, D. T., 883
Goldberg, L. R., 604, 619, 621
Goldberg, S., 153
Goldberger, A. L., 273
Golden, G. Y., 655
Goldfield, B. A., 348
Goldfried, J., 986
Goldfried, M. R., 928
Goldin, P. R., 409
Goldin-Meadow, S., 213, 349, 364, 365, 745, 765
Goldman, A. I., 525
Goldman, D., 227
Goldman, R., 943, 958, 966, 973
Goldman-Rakic, P., 281, 382, 384, 385
Goldsmith, D., 725, 726
Goldsmith, H. H., 321
Goldstein, K., 187, 190
Goldstein, M. H., 266
Goldstein, W., 725, 726, 756
Goldthorpe, J. H., 681
Gollin, E. S., 527
Gollwitzer, P. M., 522, 540, 544, 553, 584, 622, 639
Göncü, A., 498, 499, 734, 741, 761
Gone, J. P., 749
González, N., 744
Goode, W. J., 685
Goodenough, F. L., 125, 126, 127, 135, 136, 147
Goodfield, J., 59
Goodhouse, J., 702
Goodnow, J., 321, 413, 421, 441, 535, 550, 717, 718, 723, 725, 742, 743, 752, 766, 767, 768, 769, 770, 773, 775, 776
Goodwin, B., 46, 261, 341, 451
Goodwin, C., 105, 742
Goodwin, M. H., 745, 748
Goodwyn, S. W., 54
Goody, E., 736
Goossens, L., 604
Gopher, D., 602
Gopnik, A., 762
Gordon, C., 551, 622, 637
Gordon, J., 688
Gordon, W., 334
Gore, J. C., 409
Gore, S., 688
Gorman, B. K., 703
Gorman-Smith, D., 926
Gorsuch, R., 944, 945, 948, 952, 953, 977, 978, 980, 984, 988
Goss, T., 833, 834, 835, 846, 856, 859, 860, 861, 862, 867, 878, 879, 880, 881
Gotanda, N., 832, 867
Gottesman, I. I., 471, 613
Gottfried, A. E., 503
Gottlieb, A., 717, 720, 969
Gottlieb, D. E., 365
Gottlieb, G., 7, 9, 27, 39, 40, 46, 53, 94, 95, 99, 111, 142, 156, 160, 169, 170, 177, 178, 187, 210, 211, 215, 217, 218, 219, 220, 221, 222, 228, 231, 232, 233, 241, 242, 243, 244, 245, 246, 247, 248, 259, 296, 318, 341, 408, 416, 417, 436, 449, 519, 529, 584, 603, 605, 728, 867, 902, 903
Gottmann, J. M., 179
Gould, O. N., 606
Gould, S., 6, 8, 42, 46, 92, 93, 94, 106, 116, 122, 222, 474, 506, 507, 508, 519, 529, 576, 605, 947, 986
Goulet, L. R., 569, 571, 573, 589, 604
Graber, M., 303
Graf, P., 437, 597, 644
Graham, M. A., 553
Graham, S., 8, 449
Gramer, M., 438
Granger, R. C., 914
Grangvist, P., 979
Granic, I., 240
Granier-Deferre, C., 232
Granott, N., 321, 349, 363, 364, 365, 366, 367, 368, 369
Grant, R. J., 236
Gray, E. K., 632
Gray, J., 289
Gray, J. A., 629
Gray, J. R., 386
Gray, L., 245
Gray, R. D., 219, 249
Grayling, A. C., 79
Grebogi, C., 277
Green, F. L., 548, 762
Green, M. C., 768, 770
Green, S. H., 385
Greenberg, G., 2, 7, 36, 156
Greenberg, M. T., 896, 901, 926, 932
Greenberger, E., 426
Greenfield, P., 717, 718, 721, 723, 751, 752, 755, 758
Greeno, J. G., 346
Greenough, W. T., 235, 236, 604
Greenspan, R. J., 223, 224, 230
Greenwald, A. G., 315, 322, 327, 376, 379, 380, 410, 538, 619
Greenwold, M. A., 986
Gregory, A., 12, 901
Greve, W., 520, 523, 538, 539, 548, 549, 551, 552, 553, 554, 578, 579, 584, 589, 620, 634, 637, 641, 949
Griffin, J. J., Jr., 538
Griffin, P., 200
Griffiths, P. E., 219, 249
Grimm, J., 572
Grisso, T., 837
Groeben, N., 523
Groffmann, K. I., 572
Groos, K., 508
Gross, C. G., 7
Gross, J. J., 630
Gross, T. N., 831
Grossberg, S., 318, 332, 357
Grossman, J. B., 917, 926
Grossmann, K., 739, 740, 757
Grossmann, K. E., 739, 740, 757
Grotevant, H. D., 38, 441, 496
Gruber, H., 363, 367, 587
Grun, P., 227
Grusec, J. E., 151
Guardo, C. J., 549

Guenther, F. H., 318, 357
Guerra, G., 185
Guilford, J. P., 486, 487
Guisinger, S., 753
Gullotta, T. P., 928
Gump, P. V., 833
Gunnar, M. R., 547
Güntürkün, O., 609
Guo, G., 700, 703
Guo, S. W., 231
Gurwitsch, A., 194
Gustafson, S. B., 411, 427, 430, 439, 447
Gut, U., 983
Guthke, J., 603
Guthrie, D., 773
Guthrie, E. R., 131, 143
Guthrie, R., 834
Gutiérrez, K. D., 766
Gutiérrez Peña, E., 5, 156
Gutman, L. M., 917, 921
Guttman, L., 350
Gutzmann, H., 603, 612

Haan, N., 574, 666
Haber, D., 919
Habermas, J., 66
Habermas, T., 915
Hadamard, T., 484
Haden, C. A., 701
Haeckel, E., 93, 94, 123
Hagan, J., 693
Hagen, E. H., 575, 584, 603
Hager, I., 945
Hagerman, S., 536
Hagestad, G. O., 524, 550
Haggerty, K. P., 906
Haggerty, R. J., 901
Hagne, I., 387
Hahn, A., 927
Hahn, H., 602
Hahn, S., 612
Haidt, J., 692, 717, 718, 738, 756
Haig, J., 632
Haight, W., 741, 746, 749, 769
Hailman, J. P., 95, 121
Haith, M. M., 613
Haken, H., 271
Hakim-Larson, J., 633, 636
Haldane, J. B. S., 225
Hale, S., 601
Halevy, E., 58
Haley, A., 613
Halfon, N., 668, 914
Halford, G. S., 323, 342, 344, 384, 601
Hall, G. S., 91, 94, 96, 105, 106, 107, 121, 123, 125, 129, 144, 167, 383, 573, 946, 947
Hall, S., 876, 882
Hallett, D., 27
Hallowell, A. I., 762
Hallqvist, J., 668
Halperin, D., 994
Halpern, C. T., 246, 247
Halverson, H. M., 292
Hamagami, F., 583, 589, 616
Hamaguchi, E., 754
Hambrick, D. Z., 597, 602, 605, 609, 610
Hamburg, D. A., 899
Hamburger, V., 92, 217, 252
Hamer, D., 624
Hamerle, R., 589
Hamilton, M. A., 896, 897, 902, 909, 911, 918
Hamilton, S., 896, 897, 902, 909, 911, 918, 927
Hammerstein, P., 575, 584, 587, 603, 623
Han, J. J., 746
Hand, H. H., 350, 378
Hanisch, H., 973
Hanks, W. F., 742
Hanmer, T. J., 492
Hansen, D., 918
Hanson, N. R., 74, 75, 76, 343
Hansson, R. O., 591, 611, 644
Harachi, T. W., 906
Harackiewicz, J. M., 543
Haraway, M. M., 7
Hardel, R. A., 977
Harding, S., 36
Hardy-Brown, K., 498
Hare, B. R., 842, 857
Hareven, T. K., 668, 670, 678
Haring, M. J., 551
Harkness, S., 430, 449, 526, 717, 737, 738, 763, 766
Harlow, H. F., 151, 152
Harlow, R. E., 639
Harman, G., 78
Harmon, R. J., 527
Harmon-Jones, E., 629
Harms, E., 973
Harold, R. D., 905
Harpalani, V., 830, 831, 833, 834, 835, 838, 839, 841, 843, 845, 846, 848, 856, 859, 860, 861, 862, 864, 865, 866, 867, 869, 870, 871, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887
Harper, L. V., 134
Harré, R., 49, 414, 451, 523
Harrington, H., 233, 668, 685
Harris, C., 930
Harris, D. B., 569, 573, 580
Harris, J. J., 881
Harris, K. M., 700, 920, 922
Harris, P. L., 345, 959, 970, 971, 976
Harris, T. O., 424
Harris, W. A., 235
Harrison, C. R., 612
Harrison, J., 283
Hart, D., 27, 49, 67, 69, 550, 752, 756, 757, 919, 945, 984
Hart, L. M., 468
Hart, T., 296, 968, 969
Hartel, G. D., 923
Hartelman, P. A., 357
Harter, S., 109, 154, 330, 332, 352, 365, 379, 411, 525, 526, 544, 545, 546, 549, 633, 751, 753, 757
Hartman, J. L., 419
Hartmann, T., 831, 846, 847, 862, 905
Hartshorne, H., 137, 147, 983
Hartup, W. W., 419, 427, 696
Hartwell, L., 419
Harvey, J. H., 641
Harwood, R., 761, 762
Hasher, L., 601

Hasin, D., 706
Hastings, C. T., 620, 634, 638
Hastings, T. J., 666
Hatano, G., 413, 421, 441, 765, 766, 767, 768, 770, 775, 776, 777, 778
Hatchett, S. J., 762
Hathaway, W., 989
Haugaard, J. J., 441
Hauser, M. D., 338
Hauser, S., 471, 497
Havighurst, R. J., 83, 469, 541, 573, 586, 669, 698, 850, 869, 898
Hawkins, J. D., 695, 896, 897, 900, 901, 906, 915, 916, 925
Hay, D., 156, 968, 969
Hayek, F. A., 517
Hayes, D. S., 427
Hayes, J. R., 367
Hayes-Roth, B., 542
Hayes-Roth, F., 542
Hayhoe, M., 287, 288
Hayley, J., 145
Hayne, H., 286
Haynes, N. M., 913
Hayward, M. D., 703
Hazan, C., 441
He, A. W., 744
Hearne, S., 155
Hearst, E., 90
Heath, A. C., 234, 702, 819
Heath, S. B., 743, 745, 746, 749
Heatherington, E. M., 915
Heatherton, T. F., 544
Hebb, D. O., 469, 600
Heber, M., 498
Heckhausen, H., 522, 544, 546, 547, 548, 549
Heckhausen, J., 517, 528, 539, 548, 551, 552, 578, 579, 586, 590, 620, 621, 626, 631, 634, 635, 640, 641, 671, 904
Heffler, B., 418
Heft, H., 833
Hegel, G. W. F., 34, 59, 61, 62, 530
Heider, K., 373, 374, 376
Heidmets, M., 517
Heidrich, S. M., 640
Heil, F. E., 525, 543, 550
Heiman, R. J., 718, 722, 723
Hein, A., 54
Hein, K., 895
Heine, S. H., 753, 756, 760
Heine, S. J., 760
Heinz, W. R., 680
Heinze, H., 630
Hektner, J., 468
Held, R., 54
Helmchen, H., 11, 576, 614
Helmreich, R. L., 485
Helms-Erikson, H., 673
Helson, H., 423
Helson, R., 619, 633, 638
Helsper, W., 988
Hempel, C. G., 73
Hencke, R., 316, 350, 378
Henderson, B. B., 498
Hendrickson-Smith, J., 930
Hendry, L. B., 429
Henfry, A., 212
Hengst, J. A., 722, 742, 749, 778
Hennig, K., 984
Henri, V., 101, 102, 103, 118, 132
Henry, D. B., 926
Henry, K. R., 231
Heppen, J. B., 631
Herbener, E., 688, 696
Herbst, D., 187
Herbst, J. H., 633
Herder, J. G., 518
Herdt, G., 717, 718
Hergenhahn, B. R., 845
Herlitz, A., 611
Herman, M., 697, 924
Hermans, H. J., 201, 620, 638
Hernandez, D. J., 696
Herrling, S., 919
Herrmann, U., 296
Herrnstein, R. J., 7, 155
Herschberg, T., 900
Hershberger, S. L., 613
Hertenstein, M. J., 384
Hertzman, C., 668, 684
Hertzog, C., 587, 589, 600, 604, 612, 613, 632, 688
Herzberg, P. Y., 641
Herzbrun, M., 978
Herzog, A. R., 619, 633
Hess, B., 437
Hess, R. D., 756
Hess, T. M., 606
Hetherington, E. M., 1, 7, 10, 32, 33, 36, 571, 574, 682, 808, 816, 818, 837
Hettema, P. J., 409
Hewlett, B. S., 737
Heydens-Gahir, H. A., 591, 595
Hicinbothom, G., 213
Hicks, D. A., 748
Higgins, E. T., 327, 371, 525, 538, 545, 549, 751, 752
Higgins, R. L., 538, 539
Higuchi, S., 702, 706
Hilgard, E. R., 380
Hilgard, J., 128
Hill, P. C., 954
Hill, R., 670, 677, 684
Hinde, R. A., 96, 156, 219, 249, 421, 426, 445
Hintz, N., 913, 914, 927
Hipp, T., 953
Hirata, S., 169, 192
Hirsch, J., 5, 7, 9, 11
Hirschfeld, L. A., 343
Hirschfield, P., 688
Hirschl, T. A., 682
His, W., 211
Hitlin, S., 679, 701
Hitschmann, E., 949
Hitzemann, R., 223, 224
Ho, D. Y., 752
Ho, M.-W., 7, 225, 247
Hoagwood, K., 12, 13, 837
Hobart, C. J., 633, 636
Hobfoll, S. E., 593
Hobson, R. P., 38, 67
Hochstein, M., 668
Hock, H. S., 277
Hodge, J. A., 227
Hodgson, D. M., 628
Hofer, M., 152, 682
Hofer, S. M., 340, 347, 364, 583, 597, 668, 682, 702
Hofferth, S. L., 686

Hoffman, E. P., 225
Hoffman, J. P., 688
Hoffman, L. W., 233
Hoffman, M. L., 902
Hogan, A. E., 323, 332, 348, 385, 387
Hogan, D. P., 670
Hogan, N., 298
Hogan, R., 19, 80, 139
Hogarty, P. S., 345, 348, 387
Hoge, D., 959, 978
Höhn, E., 521
Holahan, C. K., 574, 638, 666, 693
Holden, C., 413
Holden, M. T. G., 183
Holland, D., 718, 745, 748, 749
Holland, J. H., 362
Holland, P. W., 446
Holliday, B. G., 857
Holliday, S. G., 492
Hollingworth, H. L., 129, 573, 596
Hollister-Wagner, G. H., 921, 928
Holloway, B. E., 926
Holmberg, D., 633
Holmes, J. G., 762
Holt, L. E., 131
Holt, R. A., 223
Hommel, B., 418, 436, 583, 596, 597, 598, 599, 600, 602, 610, 616
Honeycutt, H., 41, 179, 241, 416, 417
Honzik, M. E., 666
Honzik, M. P., 574, 666
Hood, B., 302
Hood, K. E., 156, 213, 214, 219, 230, 240, 249, 415, 482
Hood, L., 402
Hood, R., 944, 945, 948, 952, 953, 977, 978, 980, 984, 988, 990
Hoogstra, L., 717, 743, 744, 749, 761
Hooker, C. A., 197
Hooker, K., 620, 636
Hopkins, B., 416, 449
Hoppe-Graff, S., 44
Hoppe-Rooney, T., 898
Horn, J. L., 127, 132, 340, 347, 364, 417, 583, 597, 600, 613, 618
Horney, K., 145
Horowitz, F. D., 1, 7, 9, 10, 130, 419, 856, 857
Horowitz, H., 54, 60
Horvath, J. A., 606
Horwitz, A. V., 703
Houdé, O., 601
House, J., 552, 683
Howard, A., 717
Howe, G. W., 818
Howrigan, G., 737
Hoyer, W. J., 597, 600
Hrebickova, M., 620, 633
Hsu, A. Y. C., 631
Hua, J. Y., 320
Huang, L. N., 835
Hubbard, E. M., 384
Hubbard, J. J., 919, 924
Hubel, D. H., 382, 422, 424
Huber, H. P., 438
Hudley, E. V. P., 749, 769
Hudspeth, W. J., 388
Huebner, A. J., 928
Hugdahl, K., 628, 629, 630
Hughes, D., 775, 898, 913
Hughes, E., 669
Huinink, J., 700
Huizenga, H. M., 176, 177, 183, 184, 442, 607, 614, 685
Huizinga, J., 508
Huizink, A. C., 415
Hull, C. L., 131, 143, 149, 408
Hultsch, D. F., 603, 632
Humble, K., 415
Humle, T., 192
Humphreys, L. G., 613
Hundeide, K., 169
Hundert, E. M., 62, 79
Huneycutt, W. S., 244
Hung Chan, Y., 752
Hunsberger, B., 944, 945, 948, 952, 953, 977, 978, 980, 984, 988
Hunsberger, L., 978
Hunt, D. E., 425
Hunt, J. M., 153, 345, 350, 384, 387, 422
Hunt, S. P., 216, 247
Hunter, J. P., 918
Huntington, S. P., 945, 994
Hurford, J., 288
Hurlock, E. B., 132
Husén, T., 432
Husserl, E., 467
Hutchings, M. E., 244
Hutchins, E., 267
Huttenlocher, P. R., 282, 385, 602
Huxel, K., 946, 947
Huxhold, O., 591, 597, 603
Huxley, J. S., 506
Huxley, T. H., 212
Hyde, K., 958, 973, 980
Hyman, J. B., 914
Hymes, D., 742

Iacono, W. G., 615
Ialongo, N., 917
Ickes, W., 543
Ide, E., 760
Ideker, T., 402
Idler, E., 985
Ignatiev, N., 832
Iinuma, K., 387
Ikegama, Y., 756
Imanishi, K., 179, 186
Imazeki, H., 702, 706
Immordino-Yang, M. H., 321, 323, 325, 333, 335, 352, 353, 367, 388
Inagaki, K., 766, 775, 777, 778
Inghilleri, P., 471
Ingold, T., 41, 46, 49, 755, 762, 763
Ingvar, M. I., 604
Inhelder, B., 334, 532, 534
Inoue-Nakamura, N., 192
Intieri, R. C., 598
Ippolito, M. F., 925
Irby, M., 900, 906, 911, 912
Irion, J. C., 636
Irizarry, N. L., 761
Irvine, J. J., 839, 858
Irvine, S., 413
Irwin, C. E., 496
Isaacowitz, D. M., 579, 620, 630, 639
Isabella, R. A., 500
Ishii, K., 769
Israel, Y., 237
Ivey, P. K., 791

Ivinson, G., 201
Iwanaga, M., 735
Izard, C. E., 62, 63, 499
Izzo, L. D., 427

Jaakola, R., 975
Jackendoff, R., 61
Jacklin, C. N., 422
Jackson, C., 921, 928
Jackson, D. C., 627, 628, 629, 630
Jackson, D. D., 145
Jackson, J., 54, 670, 762
Jacob, F., 437
Jacobs, C., 833, 846, 856, 859, 860, 861, 862
Jacobs, F., 156, 169, 918
Jacobs, J., 103
Jacobson, K., 263, 703
Jacobson, M., 221
Jaeger, D. A., 689
Jahoda, G., 200, 716, 718, 741
Jahrsdoerfer, R., 245
Jain, E., 630
James, W., 68, 69, 111, 123, 161, 409, 411, 412, 414, 466, 497, 502, 509, 549, 731, 951, 974, 983
Janet, P., 188, 189
Janicki, D., 978
Janis, I. L., 698
Janney, J. E., 129, 573
Janoff-Bulman, R., 553, 639
Janson, H., 411
Jantsch, E., 178
Jaret, C., 832
Jarjoura, G. R., 682
Jarrett, R. L., 832, 835, 856
Järvelä, S., 412
Jarvis, G., 994
Jasievicz, J., 438
Jeannerod, M., 298
Jeeves, M., 410
Jelicic, H., 6
Jenkins, E., 321, 325, 365
Jenkins, J. J., 100
Jenkins, J. M., 820
Jenkins, W. M., 283
Jennings, H. S., 102, 121
Jennings, S., 378
Jensen, D. D., 130
Jensen, L. A., 718, 721, 738
Jensen, P., 12, 13
Jernigan, T. L., 213, 214
Jersild, A. T., 126, 128
Jersild, C. L., 126
Jessberger, S., 236
Jessor, R., 425, 718, 722, 901, 921, 923
Jessor, S. L., 425
Jiang, C. H., 255
Jiang, M., 237
Jihui, Y., 821
Joanen, T., 231
Joas, H., 190
Joe, S., 838
Johanson, D. C., 507, 508
Johansson, B., 615
Johansson, S. E., 434
Johansson, T., 430
John, E. R., 388
John, O., 618, 634
Johnson, C. N., 970, 976
Johnson, D., 849
Johnson, D. J., 857
Johnson, D. R., 682
Johnson, F., 753
Johnson, M., 48, 54, 287, 319, 340, 506, 573, 586, 587
Johnson, M. E., 667, 668, 674, 675
Johnson, M. H., 10, 279, 303, 306, 418, 597, 602, 605, 613
Johnson, M. K., 357, 691
Johnson, M. L., 348, 383
Johnson, P. M., 636
Johnson, T. E., 576
Johnson, T. R. B., 629
Johnson-Laird, P. N., 500
Johnson-Powell, G., 831
Johnston, T. D., 219, 222, 226, 228, 242, 246, 249, 704
Jolly, A., 507
Jones, D. L., 881
Jones, E., 115, 116
Jones, G., 605, 609
Jones, H. E., 127, 131, 598
Jones, J., 920, 922
Jones, M. C., 126, 130, 131, 134, 666
Jones, S., 259, 604
Jones-Walker, C., 831
Jopling, D., 751
Jordan, J., 579
Jörns, K. P., 985
Josephs, I. E., 199
Josephs, R. A., 758
Josephsson, S., 612
Joshi, H., 682
Joyner, E. T., 913
Julien, J.-P., 223
Jung, C. G., 479, 949
Juraska, J. M., 236
Just, M. A., 601

Kaas, J. H., 283
Kafatos, F. C., 440
Kagan, J., 5, 49, 378, 415, 417, 438, 442, 523, 527, 528, 531, 546, 549, 574, 584, 612, 613, 619, 622, 623, 628, 644, 666, 685, 811
Kager, A., 964, 966
Kagitcibasi, C., 168
Kahana, B., 526
Kahana, E., 526
Kahlbaugh, P., 494
Kahn, R. L., 551, 580, 587
Kahneman, D., 540
Kahoe, R. D., 985
Kail, R., 597, 601
Kainz, H. P., 54, 59
Kakar, S., 468, 718, 749, 762
Kalicki, B., 550
Kalin, N. H., 627, 628, 629, 630
Kalverboer, A. F., 416, 449
Kamin, L. J., 127, 129
Kaminski, G., 533
Kamlah, W., 555
Kamm, K., 294
Kandel, D. B., 427, 695
Kandel, E. R., 441
Kane, M. J., 601, 602, 603
Kanfer, F. H., 536
Kanowski, S., 576
Kant, I., 61, 339, 368
Kanwisher, N., 345
Kaplan, A., 74
Kaplan, B., 60, 190, 432, 951, 966

Kaplan, M. S., 838
Kaprio, J., 428
Kapstein, M., 750
Karasawa, M., 761
Kardiner, A., 833, 835, 842, 867, 879
Karli, P., 408, 411
Karmel, B. Z., 243, 247
Karmiloff-Smith, A., 10, 43, 61, 279, 303, 306, 357, 597, 605, 777
Karoly, P., 536, 537, 544, 641
Kasai, H., 235
Kaschak, M., 284, 287, 303
Kashiwagi, K., 756
Kastenbaum, R., 541
Kasulis, T. P., 753
Kath, W. L., 320
Katz, B. B., 240
Katz, D., 139
Katz, L. F., 688
Katz, R., 139
Katzir-Cohen, T., 335
Kaube, H., 606
Kauffman, S., 46, 47, 318, 320, 341, 362
Kaufman, J., 409, 689
Kaufman, S., 689
Kavsek, M., 612
Kawai, M., 169, 192
Kawamura, S., 169
Keefer, C., 735, 737, 738, 739
Kegan, R., 474, 475, 478, 482, 497, 545
Keil, F., 533, 534, 775, 776, 777, 959, 975
Keith, J., 13, 668, 672, 674, 898, 900
Kellam, S., 917
Keller, E. F., 236
Keller, H., 717, 718, 723
Keller, M., 526
Keller, T. A., 601
Kellman, P. J., 241
Kelly, G. A., 490
Kelly, J., 837
Kelso, J. A. S., 273, 275, 276, 277, 282, 306, 320, 403, 437
Kelvin, P., 438
Kemmelmeier, M., 750
Kempermann, G., 236, 420, 584, 604, 610, 612
Kendler, H. H., 154
Kendler, K. S., 702, 705
Kendler, T. S., 154, 348
Kennedy, B., 320, 329, 330, 332, 348, 349, 354, 356, 357, 358, 359, 360, 361, 362, 438
Kennel, J., 839, 844, 890, 891
Kenny, P., 242, 245
Kent, R. D., 266
Kent, T., 66
Kerckhoff, A. C., 680, 681
Kermoian, R., 384
Kern, D., 539
Kerr, J., 153
Kerr, M., 406, 410, 425, 428, 430
Kertzer, D. I., 668, 672, 674
Kessel, F., 717, 718, 723, 725, 742, 764, 766, 776
Kesselring, F., 520
Kessen, W., 94, 96, 107, 733, 764
Kessler, R. C., 552, 573, 702
Kestenbaum, V., 466, 467, 468, 502
Keverne, E. B., 216, 247
Key, C. B., 127
Keyes, C. L. M., 633, 895, 896
Keyes, S., 811
Kidd, J. R., 227
Kidd, K. K., 227
Kielsmeier, J. C., 919
Kiesner, J., 428
Kihlbom, M., 434
Kihlstrom, J. F., 410, 549, 751
Kim, C. J., 238
Kim, H., 758
Kim, K. J., 688
Kim, S. K., 237
Kim, S. Y., 696
Kim, U., 758
Kim, Y. K., 760
Kimball, C., 988
Kimball, M., 906
Kindermann, T., 173, 179
King, A., 265, 290
King, A. J., 244
King, A. P., 218, 266
King, P. E., 932, 944, 952, 971
King, P. M., 333, 358, 386
King, V., 821
Kingdom, D., 989
Kingstone, A., 242
Kinney, L., 629
Kinney, M. D., 152
Kinoshita, T., 702, 706
Kiraly, M., 237
Kirkpatrick, J., 499, 717, 718
Kirkpatrick, L., 979
Kirkwood, T. B. L., 225, 576, 597, 623, 628
Kirschner, S. R., 199
Kirshner, B., 918
Kirson, D., 372, 373
Kitayama, S., 354, 375, 717, 718, 722, 723, 730, 749, 752, 753, 754, 756, 757, 758, 760, 762, 763, 769, 859, 860
Kitchener, K. S., 332, 333, 351, 358, 386
Kitchener, R. F., 264, 347
Kivnick, H. Q., 493
Klackenberg, G., 426, 450
Klackenberg-Larsson, I., 411
Klaczynski, P. A., 429
Klaghofer, R., 978
Klahr, D., 339, 346, 364
Klauer, T., 551, 626, 634
Klaus, C. R., 636
Klaus, M., 839, 844, 890, 891
Klaus, P. H., 891
Klebanov, P. K., 682
Klein, M. W., 695
Klein, R., 538, 545
Klem, A. M., 911, 914, 924, 927
Klepsch, M., 972
Kliegl, R., 530, 577, 585, 591, 593, 601, 602, 603, 611, 612
Kline, J. P., 630
Kling, J., 688, 689
Klinger, E., 536, 538, 540, 552, 553
Klintsova, A., 235
Klix, F., 611, 623
Kloep, M., 428
Klopfer, P. H., 95, 121

Klosinski, G., 987
Kluckhohn, C., 7
Knight, C. C., 329, 334, 335, 349, 351, 378, 379
Knorr Cetina, K., 170
Knudsen, E. I., 244
Knudsen, P. F., 244
Koch, C., 282
Koenig, H., 985
Koeske, R. D., 605
Koestler, A., 421
Kofsky, E., 334, 351
Kogan, N., 632
Kohlberg, L., 112, 155, 332, 333, 343, 348, 427, 528, 531, 533, 534, 549, 966, 983
Kohli, M., 586
Kohn, M. L., 606, 815
Koivisto, P., 448
Kojima, H., 182, 499
Kokko, K., 550
Kolaric, G. C., 408
Kolb, D. A., 467
Koller, S., 717, 718, 738, 756
Komatsushiro, M., 387
Kondo, D., 753
Konishi, M., 219
Konner, M. J., 738
Kono, H., 702, 706
Koopmans, J. R., 702
Kopp, C. B., 546, 549
Kornfein, M., 725
Kosawa, Y., 756, 759
Koshland, D. E., Jr., 225
Koshy, S., 868
Koslowski, B., 499, 545
Kosslyn, S. M., 395, 628, 629, 630
Kosterman, R., 923, 925
Kottak, C. P., 856
Kottler, M. L., 213
Kouba, E., 741
Kouzes, J. M., 485
Kovach, J. K., 247
Kovacs, S. L., 54
Kracke, B., 412
Kraemer, P., 242
Kramer, A. F., 602, 604, 612
Kramer, D. A., 492, 495
Kramer, T., 741
Krampe, R., 415, 585, 591, 594, 597, 601, 602, 604, 605, 606, 607, 609, 618
Krampen, G., 522, 525, 543, 548, 550
Krasnogorski, N. I., 130
Kratz, C., 739
Krause, S. R., 323
Krauss, S. P., 629
Kray, J., 602
Krebs, D. L., 179
Krebs, H. A., 181, 182
Krecker, M. L., 672
Krein, S. F., 694
Kreipe, R. E., 926
Kreppner, K., 118, 406, 425, 426
Kretzmann, J., 906, 913, 914
Krewer, B., 200
Kripal, J., 718
Kris, E., 479
Kristel, O. V., 768, 770
Kristeva, J., 774
Kroh, O., 947
Krueger, A. C., 311
Krueger, F., 186
Krueger, J., 539, 640, 904
Kruger, A. C., 751, 762, 778
Kruger, H., 680
Krüger, L., 172
Kruglanski, A. W., 537, 541, 555, 583, 584
Kruhl, J. H., 320
Krupat, E., 423
Krus, D. J., 334
Kruse, A., 587
Krushel, L., 216
Kuang, B., 237
Kubey, R., 184
Kubisch, A. C., 915, 932
Kubovy, M., 242
Kuczynski, L., 422, 424
Kuebli, J., 747
Kuenne, M. R., 154
Kugler, P. N., 273, 274
Kuh, D., 668, 692
Kuhl, J., 522, 536, 544
Kühl, K.-P., 603, 612
Kuhl, P. K., 241
Kuhlen, J. E., 129
Kuhlen, R. G., 573
Kuhn, C. M., 231
Kuhn, D., 45, 72, 213, 292, 494, 590
Kuhn, T., 2, 76, 340, 343
Kukla, A., 532
Kulick, D., 744
Kumpfer, K. L., 901, 926, 932
Kunda, Z., 523, 538, 554, 555
Kuner, W., 988
Kunzmann, U., 579, 607, 608, 609, 626, 630, 635
Kuo, H. H., 139
Kuo, Y., 489
Kuo, Z.-Y., 46, 96, 99, 141, 142, 219, 221, 240, 264, 265, 408
Kuperminc, G. P., 688, 919
Kupersmidt, J. B., 335, 427
Kupkova, M., 320
Kupperbusch, C. S., 631
Kurata, J. H., 982
Kurtz, K. J., 368
Kurtz, S. N., 718
Kushner, H., 971
Kusserow, A. S., 761
Küster, U., 546
Kwan, V. S. Y., 618, 632
Kwilecki, S., 951, 967, 968
Kyin, M., 702

Labouvie, G. V., 584, 590, 600, 603
Labouvie-Vief, G., 492, 493, 578, 579, 580, 581, 582, 583, 584, 597, 619, 621, 629, 633, 636
Lachicotte, W., Jr., 745, 748, 749
Lachman, M., 551, 571, 573, 609, 620, 634, 635, 636, 655
LaCrosse, J., 427, 528
Ladd, G. W., 670
Lademann-Priemer, G., 987
Ladner, J. A., 835
Ladson-Billings, G., 835, 839, 872
LaFromboise, T. D., 835
Lagercrantz, H., 424
Laing, R. D., 54
Laird, J. L., 172
Lakatos, I., 70, 74, 76

Lakoff, G., 54, 287, 319, 340, 344, 369, 373, 506
Lal, S., 871
Laland, K. N., 7
Lalonde, C. E., 27
Lamb, M., 4, 321, 486, 547
Lambert, W., 980
Lamborn, S. D., 333
Lamiell, J. T., 183
Lamkin, C. A., 246
Lampert, M., 769
Lampl, M., 348, 383
Lancy, D., 741
Land, K. C., 685
Landau, B., 282
Landesman, C., 522
Landy, F. J., 423
Lane, J., 190
Lane, P. C. R., 605, 609
Lang, F. R., 570, 580, 582, 591, 593, 595, 597, 604, 611, 671
Langdon, A., 959
Langer, E. J., 808, 809
Langer, J., 54, 189
Langer, S., 97
Langman, J., 912
Langston, C. A., 551
Lanspery, S., 927
Lanz, P., 523
Lariviere, W. R., 235
Larsen, A., 425, 426
Larson, D. B., 986
Larson, R., 184, 485, 496, 897, 900, 901, 902, 912, 918
Latash, M. L., 296
Latham, G. P., 544
Latour, B., 32, 37, 39
Laub, J. H., 5, 156, 672, 683, 685, 687, 693, 695, 698, 699, 704, 705
Laudan, L., 70, 74, 76, 79
Laufer, R. S., 670
Launier, R., 552
Laursen, B., 696
Lautrey, J., 353, 590
Lave, J., 200, 546, 717, 718, 723, 738, 770, 776
Lawrence, J. A., 190, 413, 549, 576, 597, 644
Layton, W. M., Jr., 225
Lazarus, R. S., 321, 370, 371, 408, 540, 552, 635, 641, 655
Leadbeater, B. J., 688, 751
Leahy, R., 751
Leavitt, H. J., 485
Lebiere, C., 339, 340, 347
Lebra, T. S., 718, 753, 758
Lecanuet, J. P., 232
Lecci, R., 641
Lecours, A. R., 385
LeDoux, J., 48, 412, 415
Lee, B., 546
Lee, C., 831, 835, 838, 859, 869, 870
Lee, S. M., 226
Lee, T. I., 237, 238
Lee, Y., 760, 761
Leffert, N., 12, 896, 900, 901, 905, 906, 908, 911, 912, 913, 914, 915, 918, 920, 921, 922, 923, 924, 925, 928, 929, 930
Lefford, A., 241
Lehman, D. R., 753, 756, 760
Lehman, H. C., 601
Lehrman, D. S., 46, 152, 155, 219, 226, 264, 415
Leichtman, M. D., 746, 759
Leiderman, P. H., 735, 737, 738, 739
Leisering, L., 680
Leisse, T. J., 238
Lemerise, E. A., 25
Leneuaer, M., 987
Lenk, H., 517, 523, 532
Leont'ev, A. N., 188, 200, 522, 533, 546
Leopold, L., 226
LePore, P. C., 688
Lepper, M. R., 860
Leppert, J., 415
Lerner, J. S., 768, 770
Lerner, J. V., 12, 13, 425, 477, 526, 623, 895, 915
Lerner, R. M., 1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 21, 23, 30, 36, 39, 43, 51, 52, 156, 169, 177, 179, 180, 181, 182, 195, 196, 199, 211, 213, 219, 226, 228, 232, 240, 248, 249, 259, 267, 270, 316, 347, 348, 408, 409, 415, 416, 418, 421, 425, 426, 428, 432, 436, 442, 471, 477, 481, 490, 491, 492, 506, 507, 508, 517, 519, 526, 527, 528, 529, 530, 535, 569, 570, 571, 574, 575, 580, 581, 582, 585, 587, 589, 603, 614, 621, 622, 623, 626, 635, 644, 669, 679, 701, 705, 798, 819, 895, 896, 898, 900, 901, 902, 903, 904, 905, 915, 918, 919, 920, 930, 943, 948, 971, 976
Leshner, A. I., 449
Lesser, G., 848
Leuba, J., 952
Leung, C., 760
Leung, M.-C., 155
Levelt, W. J. M., 583
Levenson, R. W., 627, 629, 630, 631, 638
Leventhal, H., 63
Leventhal, T., 13
Levi-Montalcini, R., 433
Levin, H., 149
Levin, J. S., 985
LeVine, B. B., 735
Levine, J. M., 587
LeVine, L. E., 751
LeVine, R., 356, 413, 421, 441, 469, 717, 718, 723, 725, 733, 735, 737, 738, 739, 740, 754, 759, 762
Levine, S., 245, 416, 990
LeVine, S., 735, 737, 738, 739
Levins, R., 84
Levinson, B., 603
Levinson, D. J., 469, 550, 619, 670
Lévi-Strauss, C., 468
Levy, R. I., 717, 718
Lewin, K., 2, 14, 118, 145, 146, 181, 182, 194, 195, 268, 402, 432, 442, 669, 725, 865
Lewis, C. C., 754, 756, 759
Lewis, J., 177
Lewis, M., 27, 62, 154, 195, 240, 280, 447, 499, 545, 546, 549, 751, 771

Lewis, S., 927
Lewkowicz, D. J., 26, 27, 240, 241, 242, 243, 245, 247, 469
Lewontin, R., 7, 10, 42, 44, 46, 47, 53, 84, 225, 507, 508, 519
Leyendecker, B., 762
Leykin, I., 238
Lezza, A. M. S., 227
Li, F., 685
Li, J., 322, 356, 370, 372, 375, 376, 746, 769
Li, K. Z. H., 595, 597, 600, 602
Li, P. W., 7, 9
Li, R. M., 930
Li, S.-C., 408, 418, 420, 436, 451, 570, 574, 575, 576, 578, 583, 584, 585, 586, 590, 591, 594, 595, 596, 597, 598, 599, 600, 601, 604, 603, 608, 609, 610, 616, 628, 632, 644, 743
Li, X., 930
Li, Y., 237
Liang, C., 745, 746, 759
Liben, L. S., 54
Licht, R., 388
Lickliter, R., 39, 41, 179, 213, 240, 241, 242, 243, 244, 245, 246, 247, 284, 416, 417, 903
Lidberg, L., 415
Lieberman, M., 348
Liebman, J., 688, 689
Liebow, E., 833
Lienert, G. A., 446, 615
Lifton, R. J., 750
Lightfoot, C., 167
Lillard, A., 752
Lin, L., 746
Lin, N., 703
Lindberg, L. D., 923
Lindberg, U., 406, 434
Linden, M., 576, 579, 635, 640
Lindenberger, U., 11, 167, 405, 418, 436, 442, 569, 570, 571, 572, 577, 583, 585, 589, 590, 591, 595, 596, 597, 598, 599, 600, 601, 602, 604, 605, 606, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 626, 627, 634, 904, 944
Lindenthal, J. J., 995
Lindzey, G., 144
Link, B. G., 683, 704
Linville, P. W., 554, 634
Lipan, O., 238
Lipp, H. P., 238
Lippitt, R., 146
Lippman, L., 895, 901, 932
Lipps, T., 199
Lipsitt, L. P., 128, 527, 572, 575, 580, 581, 582, 586
Little, B. R., 541
Little, T., 630, 635, 636
Little, T. D., 442, 668
Little, T. O., 757
Littman, R. A., 90
Liu, W. T., 835
Liu, X., 706
Lloyd, D., 242, 703
Lockard, J. S., 624
Locke, B. Z., 637
Locke, E. A., 544
Locke, J., 337, 414
Lockhart, D. J., 255
Loeb, J., 146
Loeber, R., 695
Loehlin, J. C., 633, 866
Loevinger, J., 497, 620
Löfgren, L., 450
Logie, L., 972
Lohmann, H., 777
Loiselle, L., 918
Lonczak, H. S., 896, 897, 900, 916, 925
London, I. D., 248
Long, D., 974, 975
Looman, C. W., 684
Loomis, A. M., 135
Loomis, S. L., 703
Lopez, D., 608
Lord, S., 506, 821
Lorenz, F. O., 685, 688
Lorenz, K., 142, 226, 235, 264, 506, 903
Lorion, R. P., 896
Lotman, J. M., 200
Lott, M. T., 227
Louis, B., 603
Lourenço, O., 77, 342, 343, 606
Lovallo, W. R., 627, 628, 629
Lövdén, M., 606, 611, 612, 613, 614, 615, 616
Love, G. D., 636
Lovejoy, A. O., 56
Lowe, E. D., 717
Lowe, J. C., 674
Lowe, R. C., 334, 351
Lu, H. H., 672
Lubart, T. I., 353
Luborsky, E., 377
Luborsky, L., 376, 377
Luckmann, T., 199
Lucy, J. A., 718
Ludwig, J., 5, 156, 688
Luhmann, N., 32
Lukas, K. E., 602
Lukes, S., 753
Lumley, M. A., 629
Lumsdaine, A. A., 698
Lumsdaine, M. H., 698
Lumsden, C. J., 247
Lund, J., 237
Lundberg, U., 417
Lupski, J. R., 225
Luria, A. R., 31, 66, 139, 412, 413, 441, 449, 519, 522, 544, 546
Lüscher, K., 679
Luster, T., 803, 805, 806
Luthar, S. S., 697, 835, 836, 841, 842, 869, 887, 905, 915, 916
Lütkenhaus, P., 545, 751
Lutz, C., 717, 718
Lykken, D. T., 614, 624
Lynam, D., 408
Lynch, C. L., 332, 351, 358, 386
Lynch, E., 777
Lynch, J., 668
Lynch, M., 245
Lynd, H. M., 667
Lynd, R. S., 667
Lynn, S., 991
Lyons, J. S., 986
Lyons, N. P., 492
Lyons-Ruth, K., 377
Lyra, M. C. D. P., 195, 362

Maarouf-Veray, F., 227, 228
Maas, I., 11, 579, 636, 641

Maccoby, E. E., 1, 7, 10, 33, 36, 149, 152, 419, 422, 425, 426, 496, 915
MacCombie, D. J., 213, 214
MacDonald, G. B., 932
MacDonald, K., 811
MacDonald, S. W. S., 603
Mace, F. C., 537
Mace, W., 306
Macfarlane, J. W., 666
Machado, A., 77, 342, 343, 606
Maciel, A. G., 608, 621
Maciel, D. A., 193
MacIntyre, A., 476
Mack, K. J., 247
Mack, P. A., 247
Mackenbach, J. P., 684
MacKenzie, M. J., 448
MacKie, M., 988
MacLeod, J., 881
Macmillan, R., 701
Macomber, J., 263
Madden, P. A. F., 702
Maddox, S. J., 921
Madge, N., 690
Madsen, M. C., 902
Madsen, R., 755, 756
Maehr, M., 503, 505, 506
Maercker, A., 587, 607, 608, 609
Maffei, M., 226
Maggs, J. L., 408
Magnus, K., 632
Magnus, P., 819
Magnuson, K. A., 5, 156
Magnusson, D., 6, 7, 11, 14, 36, 37, 39, 49, 156, 202, 219, 249, 401, 403, 404, 405, 406, 407, 408, 411, 413, 415, 416, 417, 418, 419, 420, 422, 423, 425, 427, 430, 431, 432, 433, 434, 435, 438, 439, 440, 442, 443, 444, 445, 446, 447, 448, 449, 450, 535, 571, 575, 582, 587, 589, 611, 621, 626, 642, 644, 668
Magnusson, R., 387
Magovcevic, M., 190
Maguire, M. C., 673
Mahapatra, M., 718, 721, 732, 739, 756, 760
Maher, B. A., 143
Maher, W. B., 143
Mahoney, J., 156, 416, 420, 620, 925
Maier, G. W., 541
Maier, N. R. F., 2
Maier, S. F., 131, 435
Main, M., 377, 499, 545, 816
Maitland, S. B., 598
Major, B., 749
Malatesta, C. W., 62
Malatesta, C. Z., 62
Malinowski, B., 721
Mameli, M., 41
Mamman, Z., 706
Mandelbaum, D. G., 741, 743
Mandl, H., 587
Mandler, G., 63
Mandler, J. M., 61, 604
Mangelsdorf, S., 751, 757
Mangold, O., 213
Manke, B., 32
Manly, B. F., 446
Manners, J., 638
Mannes, M., 896, 901, 906, 908, 911, 913, 914, 915, 921, 924, 927
Manor, O., 683
Manstead, A. S. R., 540
Manturzewska, M., 441
Mao, L., 761
Maraganore, A., 328, 381
Marcelis, M., 702
Marcet, B., 227, 228
Marchant, G. J., 922
Marcia, J. E., 496
Marcoen, A., 604
Marcovitch, S., 26, 27
Marcus, D. E., 549
Marcus, G. F., 320
Mare, R. D., 683, 688
Mareschal, D., 345
Margolis, J., 53
Marini, M. M., 674
Markam, S. S., 374
Markey, F. V., 126
Markman, E., 548
Marks, L., 241, 977, 978
Markstrom-Adams, C., 835, 838, 841, 842, 844, 850, 871
Markus, H., 354, 375, 413, 421, 441, 545, 549, 618, 619, 633, 717, 718, 722, 723, 730, 749, 750, 752, 753, 754, 756, 757, 758, 760, 761, 762, 763, 859, 860
Marquis, D. B., 131
Marquis, J., 668
Marriott, M., 468
Marrow, A. J., 796
Marrs, G. S., 385
Marschak, M., 521, 541
Marsh, H. W., 634
Marshall, E., 238
Marshall, V. W., 680
Marsiske, M., 552, 570, 578, 579, 580, 582, 583, 591, 592, 594, 595, 597, 606, 611, 612, 625, 627, 631, 637, 638, 639, 641, 644, 671
Martin, A., 409
Martin, D. I. K., 225
Martin, G. M., 576
Martin, J. A., 496
Martin, J. E., 953
Martin, L., 763
Martin, L. L., 541, 555
Martin, L. R., 623, 638, 652
Martin, N. G., 702
Martin-Barbero, J., 774, 775
Martini, M., 499, 767
Marton, F., 423
Maruna, S., 687
Marvin, R., 735
Marx, J. L., 260
Mascolo, M. F., 521
Mascolo, M. J., 322, 370, 372, 376
Masiello, T., 749
Maslow, A., 467, 476, 479, 753, 986
Mason, W. A., 99, 152
Massimini, F., 471
Masten, A. S., 621, 718, 905, 919, 924
Masters, J. C., 152
Matas, L., 501
Mateer, F., 98, 102, 119, 130
Mathew, A., 293
Mathis, C., 223
Matousek, M., 388
Matseoane, K., 706

Matsuba, M. K., 945, 984
Matsumoto, H., 375, 757, 760, 763
Matsushita, S., 702, 706
Matsuzaki, M., 235
Matsuzawa, T., 177, 192
Matthews, S., 683
Mattick, H. W., 699
Maturana, H., 181, 520, 582
Matute-Bianchi, M. E., 843
Maughan, B., 691
Maurer, D., 283
Mauro, V. P., 216
May, A., 609, 995
May, M. A., 813, 983
May, M. S., 137, 147
Mayer, A. K., 634, 640
Mayer, K. U., 11, 551, 571, 573, 584, 586, 589, 615, 671, 674, 680, 681, 700
Maynard, A., 717, 718, 723
Mayr, E., 56, 402, 403, 420, 433, 434, 451
Mayr, U., 585, 601, 602, 629, 630
Mazur, E., 340
Mazza, J. J., 906
Mazziotta, J. C., 602
McAdams, D. P., 620
McAdoo, H. P., 762
McArdle, C. G., 881, 882
McArdle, J. J., 5, 156, 583, 589, 611, 612, 616, 624
McAuley, E., 612
McBride, T., 244, 245
McCabe, A., 745
McCall, R. B., 30, 345, 348, 387, 433, 448, 530
McCall, R. M., 600, 601, 612
McCarthy, D., 138, 139, 140
McCarthy, K., 922
McCarthy, T., 65, 66, 69
McCartney, K., 235, 519, 606, 615, 619, 866
McClearn, G., 340, 347, 614, 615, 702, 819
McClelland, J. L., 303, 596
McClelland, P., 807, 821, 822, 823, 824
McClenny, B. D., 629
McClintock, E., 425
McClintock, M. K., 415
McCord, J., 413, 427
McCormack, M. A., 217
McCrae, R. R., 378, 488, 619, 620, 621, 632, 633, 635, 637
McCrone, J., 413
McCubbin, J. A., 231
McCubin, H. I., 425, 426
McDade, L., 244
McDonough, P., 683
McDougall, W., 119, 130
McEwen, B. S., 419
McFadden, S. H., 953, 985
McFarland, C., 540
McGeer, T., 287
McGrath, S. K., 613
McGraw, A. P., 768
McGraw, M., 128, 135
McGraw, M. B., 140, 142
McGraw, M. G., 281
McGue, M., 226, 233, 615, 624, 702
McGuire, A. M., 701
McGuire, C. U., 549
McGuire, C. V., 354
McGuire, M. T., 415
McGuire, S., 32
McGuire, W. J., 354, 549
McHale, S. N., 673
McIntosh, D. N., 990
McIntosh, P., 832, 836, 839, 869
McIntosh, W. D., 555
McKenna, J. J., 725
McKenry, P. C., 929
McKinney, M. L., 222
McKinnon, J., 816
McKnight, J., 913
McLanahan, S. S., 687, 694
McLaughlin, G. H., 323
McLaughlin, M., 912, 918
McLellan, J., 917, 919, 920, 945, 984
McLeod, J. D., 704
McLin, D., 299, 300, 301, 306
McLoyd, V. C., 8, 835
McNamara, K. J., 222
McNamara, S., 428
McNemar, Q., 127
McRae, K., 284
Meacham, J. A., 493, 517
Mead, G. H., 65, 113, 190, 494, 501, 669, 762, 798
Mead, M., 718, 733
Meadow, M. J., 946, 985
Meakin, P., 261
Meaney, M. J., 236
Medawar, P., 416, 576
Medin, D., 537, 717, 729, 777
Medina, N., 438
Medler, M., 620, 622, 634
Mees, U., 534
Meguro, Y., 700
Mehta, P., 860, 861, 862, 863
Meigs, A., 183
Meinz, E. J., 602
Meissner, W. W., 949
Mel, B. W., 320
Mellenbergh, G. J., 431
Meller, J., 438
Mellner, C., 448
Mellon, R., 242, 243
Mellott, D., 315, 322, 327, 376, 379, 380
Meltzoff, A. N., 240, 241
Memmo, M., 898, 901, 906
Mendelson, M. J., 241
Meng, K., 745
Menon, U., 717, 718, 762
Meredith, M. A., 240, 244, 283, 589
Merleau-Ponty, M., 48, 467
Mernissi, F., 184
Merrick, S., 377
Merton, R. K., 667, 670, 671
Merzenich, M. M., 283
Meschke, L. L., 442
Mesquita, B., 718, 759, 766
Messick, S., 80
Metcalfe, J., 602
Metten, P., 225, 235
Metz, E., 919
Mey, G., 184
Meyer, A., 335
Meyer, J. S., 542
Meyer, J. W., 586
Meyer-Probst, B., 417
Meyers, E. W., 7, 9
Meyerson, I., 189
Miao, C.-H., 368
Miccery, T., 444

Michaels, S., 745, 769
Michel, G., 7
Michell, J., 172
Michelsen, E., 918
Mickler, C., 635
Middleton, D., 498
Midgley, C., 429, 503, 504, 505, 506, 690, 921
Miech, R. A., 693
Mikhailov, A., 437
Milevsnic, R., 216, 247
Miller, A., 547, 762
Miller, D. B., 213
Miller, D. T., 540
Miller, E. K., 601
Miller, G. A., 522, 536
Miller, J., 38, 66, 434, 717, 718, 721, 722, 739, 749, 752, 761
Miller, N. E., 144, 149
Miller, P., 413, 421, 441, 737, 738
Miller, P. H., 364, 548
Miller, P. J., 717, 718, 721, 722, 723, 725, 741, 742, 743, 744, 745, 746, 747, 749, 754, 759, 761, 765, 766, 769, 770, 776, 778
Miller, P. M., 356
Miller, W. R., 915, 923, 953
Mills, C. W., 665
Mills, P., 438
Mills, W., 95, 96, 123, 128
Milne, B. J., 684, 685, 703
Minch, E., 181
Minear, M., 616
Miner, M., 986
Minsky, M., 771
Minton, H. L., 125, 127
Mintz, J., 741, 746, 749, 754, 761
Minuchin, P., 426
Mischel, H. N., 544
Mischel, T., 523
Mischel, W., 151, 352, 401, 406, 432, 481, 544, 602, 621, 622, 623
Mishler, E. G., 5, 156
Miskimins, R. W., 554
Mistretta, C. A., 242
Mistry, J., 498, 499, 734, 761
Mitrushina, M., 613
Mitterauer, M., 670
Mizuno, T., 387
Mjchard-Vanhée, C., 228
Modell, J., 6, 7, 90, 668, 670, 768, 900
Moen, P., 673, 675, 679, 807, 821, 822, 823, 824
Moeser, R., 757
Moessinger, P., 198
Moffitt, T., 233, 408, 415, 431, 668, 685, 695, 916
Moghaddam, F. M., 199
Mogil, J. S., 235
Molander, B., 448, 609
Moldin, S. O., 224
Molenaar, I. W., 30
Molenaar, P. C., 5, 156, 176, 177, 183, 184, 206, 290, 347, 357, 362, 442, 447, 605, 606, 612, 613, 614, 647, 685
Molina, J. C., 242
Molina, M., 241, 245
Molinari, L., 743, 748
Mondloch, C. J., 283
Monroe, W. S., 135
Monsour, A., 330, 332
Montada, L., 540
Montagu, A., 506, 507
Montemayor, R., 751, 928
Montessori, M., 504, 505
Montgomery, S., 402, 683
Moody, S. A., 221
Moore, B., 432, 746
Moore, C., 7, 844
Moore, D. R., 244, 425
Moore, D. S., 224, 228
Moore, J. W., 674
Moore, K. A., 895, 901, 924, 925, 932
Moore, M., 869, 870, 891
Moorehouse, M., 820
Moreland, R. L., 423
Morelli, G., 725, 726, 735, 791
Moreno, A., 178
Moreno, M., 183
Morenoff, J., 701, 913
Morgan, C. L., 94, 96, 111, 112, 121, 170, 176, 177, 180
Morgan, H. J., 373
Morgan, J. J. B., 130
Morgan, S. P., 685
Morikawa, H., 756, 759
Morris, B., 753
Morris, P., 50, 177, 421, 525, 794, 797, 799, 822, 823, 900, 910, 911, 912, 918, 926
Morrison, F. J., 154
Morrobel, D., 905
Mortimer, J., 665, 680, 681, 682, 696, 900
Moshman, D., 199
Mosier, C., 498, 499, 734, 761
Moskowitz, G. B., 544
Moss, H., 528, 574, 622, 666, 685
Moulines, C. U., 531, 532
Mower, G. D., 217
Mowrer, O. H., 144, 149
Moya, C. J., 522, 523
Mrazek, P. J., 901
Mroczek, D. K., 632
Much, N. C., 717, 718, 721, 722, 723, 732, 739, 756, 760
Muchisky, M., 276
Mueller, E., 139
Mueller, R. A., 932
Mueller, R. H., 108, 109, 110, 111, 112, 113, 114
Mueller, U., 51, 53, 63, 67, 68
Muir, J., 228
Muir, R., 153
Mulatu, M. S., 606
Mulder, E. J. H., 415
Mulder, N., 758
Mullally, P. R., 753, 754, 762, 763
Mullen, M. K., 759
Müller, A. W., 520
Müller, F., 223
Müller, U., 238
Müller, V., 604
Müller-Brettel, M., 571
Müller-Hill, B., 7
Mulvey, D., 752
Mumme, D. L., 24, 25
Munakata, Y., 44, 45, 302, 303, 305
Munholland, K. A., 377
Munn, N. L., 96, 130
Munóz, R. F., 901

Munoz-Miller, M., 831
Munroe, R. H., 728
Munroe, R. L., 143, 144, 145
Mural, R. J., 7, 9
Murchison, C., 90, 97, 125, 147
Murdaya, U., 373, 374
Murphy, L. B., 136
Murphy, R. J. L., 959
Murphy-Berman, V., 750
Murray, C., 7, 155
Murray, H., 7
Murray, J. D., 179, 262
Murray, L., 916
Murry, V. M., 428, 696
Mussa-Ivaldi, F. A., 298
Mussen, P., 90, 109, 574, 666
Muxen, M., 425, 426
Myers, J. K., 995
Myers, S. L., Jr., 832

Na, K., 761
Nadeau, J. H., 224, 225
Nag, M., 734
Nagel, E., 26, 70, 528
Nagel, S., 426
Nagin, D. S., 447, 685, 695
Nakahara, H., 235
Nakamura, J., 468, 469, 470, 477, 484, 491, 918
Nakkula, M., 927
Nanda, S., 835
Neal, L. J., 549
Neckerman, H. J., 427, 433, 447
Neely, A. S., 604, 612
Neimeyer, R., 521
Neisser, U., 745, 750, 751, 762
Nelesen, R. A., 438
Nelson, C. A., 409, 420, 594
Nelson, D., 763
Nelson, E. C., 234, 702
Nelson, K., 320, 321, 740, 749
Nemeroff, C., 717
Nesselroade, C. S., 607, 612
Nesselroade, J. R., 2, 5, 156, 176, 177, 182, 183, 184, 441, 442, 446, 447, 448, 539, 570, 580, 586, 587, 588, 589, 600, 607, 610, 612, 614, 616, 619, 624, 630, 631, 632, 676, 685, 904
Neter, E., 639
Neugarten, B. L., 524, 550, 569, 573, 667, 674, 675, 693
Neumann, E.-M., 590
Neville, H. J., 279
Neville, P. R., 807
New, R. S., 737
Newcomb, T. M., 688, 696
Newell, A., 306, 338
Newman, D., 200
Newman, J. L., 346
Newmann, J. B., 551
Newport, E. L., 5, 33, 61, 605
Neyer, F. J., 633
Nguyen, L., 844
Ni, L., 238
Nicholls, J. G., 547
Nicolis, G., 195
Nicolopoulou, A., 745, 747
Niedenthal, P., 545, 551
Nietzsche, F., 476
Nieuwenhuys, O., 169
Niggli, A., 978
Nihira, K., 773
Nijhout, H. F., 42, 233
Nilges, P., 554
Nilsson, L.-G., 448, 794
Ninio, A., 325, 344
Nipkow, K. E., 964
Nisbet, R., 56, 59, 673
Nisbett, R., 538, 717, 723, 753
Nisenbaum, L. K., 238
Noack, P., 427, 682
Noam, G., 328, 376, 377, 381, 579
Nobiling, E., 947
Noë, A., 287
Noel, M., 213
Noguchi, J., 235
Noll, E., 845, 881, 887
Noll, L., 871
Norasakkunkit, V., 757, 760, 763
Nordhaus, W. D., 553
Norem, J. K., 551
Norem-Hebeisen, A. A., 549
Norenzayan, A., 970, 971
Norman, K., 740
Norris, L., 622
Norris, T., 906, 913, 914
Northcott, H., 994
Nosek, B. A., 315, 322, 327, 376, 379, 380
Nosten-Bertrand, M., 220, 228
Novacek, J., 635
Novikoff, A. B., 2
Novikoff, B., 440
Nowak, A., 362, 447
Nowlis, V., 149
Nozick, R., 555
Nucci, L. P., 27, 69
Nunes, T., 770
Nurius, P., 545, 752
Nurmi, J.-E., 429, 448, 550, 551, 636
Nuttin, J. R., 542
Nyberg, L., 448, 597, 602, 604, 615
Nye, R., 968, 969
Nye, W. C., 973
Nyman, B., 418
Nysted, L., 794

Oakes, L. M., 278
Oates, G., 606
Oberauer, K., 601
Obeyesekere, G., 200
Obidah, J. E., 881
O'Brien, M. U., 926, 932
Ochs, E., 499, 739, 743, 744, 745, 747, 748, 752, 762, 770
O'Connor, C., 372, 373
O'Connor, E. E., 327, 377, 379, 381
O'Connor, T. G., 441
O'Doherty, J., 606
Odom, D. T., 237, 238
O'Donnell, L., 919
O'Donoghue, J. L., 918
Oerter, R., 533, 546, 550, 551, 758, 945
Oesterle, S., 682
Oettingen, G., 442, 639, 757
Ogbu, J., 429, 835, 836, 845, 878, 879, 880, 881, 882
Ogden, T. H., 54
Ogilvie, D. M., 631
Ogino, M., 759
Oh, H. J., 683
Ohlig, K. H., 946
Öhman, A., 410
Okada, N., 768

Okami, P., 725, 727
Okamoto, Y., 333, 342, 353, 357, 369
Okun, M. A., 551, 641, 652
Olah, A., 413
O'Leary, D. D. M., 434
Oliveira, Z. M. R., 195
Oliver, I., 605, 609
Oliveri, M. E., 426
Oller, D. K., 245, 266
Olmstead, R., 725, 727
Olson, D. H., 425, 426
Olson, G. M., 545
Olson, L. S., 681
Olson, M. H., 845
Olson, S. L., 498
Oman, D., 982
Omi, M., 882, 883, 884
O'Neil, R., 426
Oosterwegel, A., 752
Opitz, J. M., 46
Oppenheim, R. W., 142
Oppenheimer, D., 725, 726
Oppenheimer, J. M., 94
Oppenheimer, L., 67, 545, 752
O'Rahilly, R., 223
O'Rand, A. M., 672
O'Regan, J. K., 287
O'Reilly, R. C., 305
Oreland, L., 415
Orellana, M. F., 771, 774
Ornstein, P. A., 89, 90, 108, 132, 154, 573, 669, 707
Ortiz, J., 415
Osborn, H. F., 111, 112
Osborn, P., 932
Oser, F., 946, 952, 953, 959, 961, 963, 964, 965, 966, 978, 980, 981, 988, 990, 996
Osgood, C. E., 327, 374
Osher, D., 917
Osiewacz, H. D., 576
Osmer, R. R., 981
Ostendorf, F., 442, 620, 633
O'Sullivan, M., 373, 374
Ott, E., 277
Oura, Y., 766, 767, 776
Overton, W. F., 1, 5, 8, 18, 21, 25, 26, 28, 30, 31, 32, 34, 36, 39, 43, 45, 49, 51, 52, 53, 54, 57, 59, 60, 61, 63, 70, 71, 72, 74, 75, 79, 80, 346, 405, 528, 532, 535, 549, 580, 586, 903
Ovesey, L., 833, 835, 842, 867, 879
Oyama, S., 36, 39, 40, 42, 43, 187, 211, 219, 228, 246, 249, 259, 527
Oyemade, U. J., 856
Oyserman, D., 749, 750
Ozaki, H., 225
Ozarak, E., 977
Ozer, D. J., 446

Pack, R., 930
Packer, M., 438, 732, 741
Pagano, P., 167
Paget, K., 376
Pagliari, C., 616
Paige, L. Z., 917
Paikoff, R. L., 408, 412, 430
Pakstis, A. J., 227
Palincsar, A. S., 349
Pallas, A. M., 680
Palmiter, R. D., 238
Palmore, E., 985
Pampel, F. C., 676
Pancake, V. R., 816
Pancer, M., 918
Pandey, R. B., 468
Pantev, C., 609
Pantoja, A. P., 195
Papillo, A. R., 925
Papousek, H., 507, 545
Papousek, M., 507, 545
Parasuraman, R., 537
Pargament, K., 953, 984, 990
Paris, S. G., 102, 151
Parish, S., 718
Parisi, D., 10, 357, 596, 597, 605
Park, D., 597, 615
Park, L., 718, 721, 732, 739, 756, 760
Park, R., 615
Parke, R. D., 6, 7, 89, 90, 151, 573, 668, 669, 670, 707, 811
Parker, S. T., 247
Parkhill, J., 183
Parkinson, B., 540
Parmelee, A. H., 811
Parsons, J., 751
Parsons, S., 682
Parsons, T., 496, 522
Parten, M. B., 136
Parton, D. A., 150
Parziale, J., 321, 349, 363, 364, 365, 368, 369
Pascual-Leone, J., 199, 339, 384, 492, 581, 600, 601, 606, 944
Pasquale, E., 413
Passeron, J.-C., 518, 775
Pastor, D. L., 816
Pastoret, C., 228
Pasupathi, M., 609, 620, 627, 628, 629, 630, 634
Pate, E., 261
Paternoster, R., 685, 688
Paterson, D. G., 100
Patt, J., 741
Patterson, G. R., 151, 425, 694, 695, 917
Paul, S. M., 223
Paulhus, D. L., 624
Paulson, S. E., 922
Pauly, P. J., 130
Pavalko, E. K., 666
Pavot, W., 633
Peak, L., 758, 760, 762
Pearlin, L. I., 473
Peck, S. C., 428, 429
Pedersen, N. L., 614, 615, 624, 632
Pederson, A., 427
Peet, R. C., 734
Peirce, C. S., 177, 196
Pellegrini, A. D., 41
Peller, G., 832, 867
Pellerin, L. A., 682
Pennak, S., 575, 597, 603, 611, 612
Pennebaker, J. W., 541
Pennisi, E., 236
Penuel, W., 201
Pepler, D. J., 683
Pepper, M. P., 995
Pepper, S. C., 30, 68, 69, 70, 74, 339, 340
Perdue, S., 385
Peréz, B., 100
Perkins, D. F., 13, 898, 900

Perkins, D. N., 353, 367
Perkins, P., 247
Perlmutter, M., 519, 540, 571, 574, 579, 584
Perner, J., 582, 605, 975
Perret-Clermont, A.-N., 201
Perriello, L., 955, 974
Persson, J., 387
Pervin, L., 410, 422, 543, 619, 622
Perz, C. A., 642
Peters, H. E., 676
Petersen, A., 411, 415, 429, 842, 843, 850, 876
Petersén, I., 387, 388
Peterson, A., 223, 745
Peterson, C., 638, 777, 901
Peterson, D. R., 425
Peterson, J., 118, 126, 127, 132, 582, 591
Peterson, R. C., 137
Peterson, W. A., 674, 675
Petersson, K. M., 604, 609
Peto, J., 424
Petras, H., 917
Petrill, S. A., 615
Petrillo, D., 959, 978
Pettengill, S., 760
Pettigrew, T. F., 833, 842, 867
Pettit, G. S., 924
Pfeiffer, J. E., 987
Pfeiffer, R., 287
Pfister, O., 948, 949
Phelan, J., 683, 704
Phelan, P., 772, 845, 867
Phelps, E., 5, 12, 13, 156, 292, 449, 668, 895
Phelps, M. E., 602
Philliber, S., 919
Phillippe, J., 101
Phillips, M., 697, 924
Phillips, R. J., 223
Phillips, S. D., 923
Phillips, S. J., 196
Phillips, T. J., 223, 224, 235
Piaget, J., 2, 37, 40, 41, 47, 51, 60, 63, 70, 93, 111, 113, 135, 136, 138, 139, 143, 176, 197, 198, 241, 265, 278, 282, 285, 303, 305, 314, 315, 321, 323, 324, 332, 333, 334, 340, 341, 342, 343, 345, 361, 362, 363, 364, 365, 366, 383, 412, 422, 470, 473, 478, 488, 504, 508, 521, 531, 532, 533, 534, 545, 546, 547, 606, 845, 957, 958, 996
Pick, A., 241
Pickens, J., 241
Pickles, A., 425, 426, 691, 704
Pieper, C. F., 683
Pierce, C. S., 77
Pietromonaco, P., 63
Pike, K. L., 730
Pimley, S., 635
Pinker, S., 48, 61
Pinquart, M., 24, 691
Pipp, S., 333, 351, 378
Pirttilä-Backman, A.-M., 333
Pittman, K., 895, 896, 899, 900, 901, 906, 909, 911, 918, 920
Pitts, R., 982, 984
Pitts, V. P., 973
Plante, T. G., 982
Plath, D. W., 725, 726
Plato, 339, 368
Platsidou, M., 343, 353
Platt, S. A., 231
Plessner, H., 609
Plewis, I., 684
Plomin, R., 7, 32, 234, 340, 347, 413, 422, 498, 519, 529, 585, 614, 615, 623, 625, 633, 648, 659, 818, 819, 866
Plunkett, K., 10, 345, 357, 596, 597, 605
Pnevmatikos, D., 973
Poddiakov, A. N., 193
Poduska, J., 917
Poincaré, H., 424
Polak, R., 945
Polk, T. A., 615
Polkinghorne, D. E., 745
Pollard, J. A., 901
Pollner, M., 983
Polsky, A., 320
Pondy, L. R., 485
Ponirakis, A., 686
Pontecorvo, C., 201
Pook, P., 287, 288
Poole, C., 689
Poortinga, Y. H., 374, 721
Popper, K., 74
Popper, K. M., 542
Popper, K. R., 410
Porfeli, E., 671
Porges, S. W., 628
Port, R. F., 320
Portales, A. L., 629
Porter, T., 172
Posner, B. Z., 485
Posner, M. I., 613
Post, S. G., 986
Pott, M., 759
Pötter, U., 600
Potts, R., 761
Potvin, R. H., 979
Poulin, F., 427
Poulton, R., 684, 703
Powell, L. H., 982
Power, C., 668, 683, 684, 692, 983
Powers, W. T., 522, 541
Prasada, S., 302
Prashad, V., 867
Pratkanis, A. R., 619
Pratt, J. B., 973
Pratt, M. W., 745
Predmore, S. C., 538
Preece, A., 748
Prell, R.-E., 981
Prentice, D., 750
Prescott, C. A., 705
Pressey, S. L., 129, 573
Preyer, W., 94, 96, 97, 98, 99, 100, 142, 438
Pribram, K. H., 388, 522, 536
Price, L., 906
Price-Williams, D., 334
Prigogine, I., 177, 179, 269, 482, 582
Prince, S. E., 601, 616
Prinz, R. J., 921
Prinz, W., 418, 436, 583, 596, 598, 599, 602, 610, 616
Proctor, R. N., 7
Proenca, R., 226
Prosch, H., 57
Pruyne, E., 386
Pruyser, P., 950

Psaltis, C., 201
Pulkkinen, L., 411, 550, 621, 820
Pullen, S. M., 606
Purves, D., 221, 235
Putnam, F., 380
Putnam, H., 54, 55, 57, 63, 68, 69, 74, 75, 521, 532, 534

Qin, Y., 339, 340, 347
Quetelet, A., 572
Quine, W. V., 74, 114, 538
Quinn, J., 912
Quinn, N., 718
Quinton, D., 691, 704

Rabbitt, P. M. A., 590
Rabe-Hesketh, S., 5, 156
Rabiner, D. L., 25
Rabinowitz, L. S., 689
Rachman, S., 670
Radell, P. L., 241, 242, 243, 245, 247
Radke-Yarrow, M., 422, 424
Radziszewska, B., 749
Raff, R. A., 46
Raftopoulos, A., 26
Raglioni, S. S., 241
Raichle, M. E., 386
Raine, A., 415
Raizada, R., 357
Rakic, P., 382, 384, 385
Rakotovao, R., 230
Raleigh, M., 415
Ram, N., 2, 5, 156
Ramachers, G., 974
Ramirez, M., III, 334
Ramirez, M. L., 919, 924
Rampon, C., 235, 236, 255, 702
Randall, J. H., 72
Rank, M. R., 682
Rao, R., 287, 288
Rapaport, D., 117
Rappolt-Schlichtman, G., 316, 328
Rasch, G., 323, 350, 352
Ratcliff, D., 974
Rathod, S., 989
Rathunde, K., 466, 467, 471, 478, 479, 481, 491, 492, 497, 498, 501, 502, 503, 504, 505
Ratner, H. H., 751, 762, 778
Rau, L., 149
Raudenbush, S. W., 13, 913, 926
Rawls, J., 550
Raya, P., 200, 248, 316, 317, 320, 321, 328, 330, 332, 344, 354, 381
Rayner, R. A., 130
Raynor, J. O., 543
Raz, N., 602, 612
Rebok, G. W., 542
Recanzone, G., 283
Reddy, M., 340
Redfield, R., 719
Reed, E. S., 65, 306
Reedy, M. N., 551, 622, 637
Rees, E., 582
Reese, H. W., 1, 26, 30, 31, 32, 34, 441, 527, 528, 535, 570, 572, 575, 580, 581, 582, 586, 588, 589, 603, 614
Reeve, R., 317, 332
Regnerus, M., 971
Reich, H., 945, 953, 957, 965
Reich, K. H., 964, 982
Reid, J. B., 917
Reimer, K. S., 968, 984
Reinert, G., 91, 96, 97, 98, 100, 521, 571, 572, 600, 616
Reinhardt, J. M., 421
Reinshagen, H., 526
Reis, A., 609
Reischies, F. M., 576
Reisenzein, R., 534
Reiss, D., 32, 426, 818
Renkl, A., 587
Renner, G., 527, 536, 539, 548, 552, 555, 634, 636
Repacholi, B., 377
Resch, N. L., 917
Resch, N. R., 917, 926
Resnick, H., 926, 932
Resnick, L. B., 201, 587
Resnick, L. R., 533
Resnick, M. D., 920, 922
Rest, J., 548, 966
Retzinger, S., 376
Reuchlin, M., 590
Reuman, D., 429, 503
Reuter-Lorenz, P., 575, 582, 594, 608, 610, 644
Revenson, T. A., 641
Reye, B., 953
Reynolds, C. A., 624, 630, 632
Reynolds, G., 243
Reznick, J. S., 348
Rhodes, J. E., 911, 914, 917, 926
Rhymer, R. M., 446
Ricceri, L., 239
Ricco, R. B., 532
Richards, D. D., 778
Richards, F. A., 323
Richards, J., 989
Richards, M. H., 485, 496
Richardson, D., 284, 287, 288
Richardson, J., 978, 987, 988
Richardson, K., 240
Richman, A., 735, 737, 738, 739
Richters, J. E., 402
Rickman, M., 630
Ricks, D., 427, 528
Ricoeur, P., 68, 73, 74, 75, 76
Ridderinkhof, K. R., 601
Ridley-Johnson, R., 292
Rieckmann, N., 595, 611
Riediger, M., 579, 591, 636, 638
Riegel, K., 196, 421, 436, 490, 520, 573, 575, 580, 581, 586, 606
Rieser, J. J., 89, 573, 669, 707
Rigney, D. R., 273
Riksen-Walraven, J. M., 809, 865
Riles, L., 238
Riley, K., 526
Riley, M. S., 346
Riley, M. W., 573, 584, 586, 587, 667, 668, 674, 675
Rimer, S., 873
Rinaldi, N. J., 237, 238
Rinehart, P. M., 928
Rittenhouse, P., 769
Ritzen, M., 424
Rizzuto, A.-M., 951, 979
Robbins, M. A., 616
Robert, F., 237, 238
Roberts, B., 620, 632, 633, 634
Robertson, H. A., 216, 247
Robertson, S. S., 273
Robin, D. J., 241

Robins, L., 450, 694
Robins, R., 49, 412, 634
Robinson, D., 101, 357, 411
Robinson, M. G., 924
Rochat, P., 241
Rochberg-Halton, E., 526
Rockstroh, B., 609
Rodgers, W. L., 676
Rodin, J., 551, 692, 808, 809
Rodkin, P., 154, 441
Rodning, C., 811
Rodriguez, M. C., 905
Rodriguez, M. L., 621
Rodriguez-Zas, S. L., 235
Roeder, K., 230, 231
Roediger, D. R., 877, 891, 892
Roehlkepartain, E., 908, 913, 914, 921, 923, 925, 926, 927, 929, 931, 954, 971, 981
Roehlkepartain, J. L., 906, 914
Röesler, H.-D., 417
Roffman, J. G., 911, 914
Rogers, C., 473, 476, 479, 482
Rogers, S. C., 183
Rogers, W. H., 683
Rogoff, B., 65, 66, 67, 168, 185, 200, 316, 321, 322, 344, 347, 356, 364, 494, 498, 499, 501, 545, 546, 717, 723, 725, 726, 734, 743, 749, 761, 767, 769, 771, 773, 911
Rohner, R. P., 760
Rohwer, G., 589, 673
Roland, E., 410
Rollett, B., 964, 966, 987, 988
Romanes, G. J., 94, 95, 96, 120
Rommetveit, R., 525
Romney, A. K., 774
Ronca, A. E., 246
Rönkä, A., 411
Roodin, P. A., 597, 600
Roos, J., 949
Rorty, R., 58
Rosa, A., 188
Rosaldo, M. Z., 762
Rosas, S., 772
Rosch, E., 46, 47, 53, 69, 246, 303, 373, 466, 530, 531, 533, 534, 750
Rose, A. J., 745
Rose, D., 335
Rose, H., 41
Rose, K. M., 631
Rose, L. T., 335
Rose, R. J., 428, 614, 702
Rose, S., 41, 216, 227, 228, 236, 241, 247
Rose, S. A., 240, 247
Rose, S. P., 323, 332, 335, 364, 382, 383, 387, 388, 389, 944
Rose-Krasnor, L., 816, 918
Rosen, K. M., 217
Rosen, L., 752
Rosenbaum, J. E., 689
Rosenberg, F., 550
Rosenberg, M., 550, 553, 670, 751
Rosenberg, R., 974
Rosenberger, N. R., 718, 758
Rosenblatt, J. S., 152
Rosenblum, L. A., 499
Rosier, K. A., 743, 748
Rösler, F., 575, 582, 608, 610, 644
Ross, A. O., 150
Ross, D., 104, 171
Ross, G., 545
Ross, J., 989
Ross, L., 538, 860
Ross, M., 640
Ross, N., 717, 729, 777
Ross, W. D., 55, 56
Rossetti-Ferreira, M. C., 195, 202
Rotenberg, E. J., 200, 248, 317, 320, 321, 330, 332, 344, 354
Roth, J., 900, 901, 905, 906, 912, 916
Rothbart, M. K., 613, 623, 627, 628, 629, 630
Rothbaum, F., 552, 759
Rothermund, K., 538, 540, 548, 552, 554, 555, 620, 622, 634, 636, 637, 639
Rothlisberg, B. A., 922
Rott, C., 636
Rotter, J., 151, 422, 811
Roubertoux, P., 213, 220, 227, 228
Rousseau, J. J., 946
Roux, W., 211
Rovee-Collier, C., 286
Rowe, D. C., 7, 8, 702, 703, 929
Rowe, J. W., 551, 580, 584
Rowell, J. A., 198
Rozeboom, W. W., 79
Rozin, P., 717
Rubel, E. W., 219
Rubin, K. H., 508, 683, 816
Ruble, D. N., 549, 640, 772
Rude, S. P., 954, 971
Ruderman, A., 365
Rudinger, G., 449, 517, 587, 589, 611
Rudman, L., 315, 322, 327, 376, 379, 380
Rudolph, L., 172
Ruff, H. A., 240
Ruhland, R., 348, 351, 352, 358, 387
Ruiselova, Z., 430
Rumbaut, R., 680, 700
Runco, M. A., 487
Rushton, J. P., 7, 8
Russell, E. S., 227
Russell, G., 550
Russell, J., 51, 79, 370, 372, 718
Russell, R. W., 409, 432
Rustak, B., 216, 247
Rutter, M., 32, 196, 340, 347, 417, 425, 449, 527, 528, 578, 621, 683, 690, 691, 702, 704, 805, 820, 901, 989
Ryan, J. A., 896, 897, 900, 916
Ryan, R. M., 755
Ryan, S. A., 926
Rybash, J. M., 597, 600
Rychlak, J. F., 490
Rydelius, P.-A., 424
Ryder, N. B., 588, 667, 668, 674, 675
Ryder, R. G., 622
Ryff, C., 401, 429, 573, 579, 587, 620, 633, 637, 638, 640, 692, 761, 918, 932
Ryu, S., 696

Saarni, C., 24, 25
Saastamoinen, M., 820
Sabini, J., 35, 522
Sacker, A., 682
Sadd, M., 987

Sadeh, A., 725
Sadovnik, A., 501
Saffran, J. R., 605
Saha, A. K., 261
Saile, H., 554
Saint-Hilaire, E. G., 211
Saito, R. N., 902, 906, 911, 931
Säljö, R., 765
Salmela-Aro, K., 448
Salomon, G., 353, 367
Salthe, S. N., 222
Salthouse, T. A., 528, 553, 571, 577, 590, 598, 600, 601, 602, 606, 609, 610, 611, 627
Salvatore, S., 167
Salzman, L., 988
Sameroff, A., 109, 269, 357, 408, 428, 429, 432, 441, 448, 535, 683, 917
Sampson, E. E., 49, 752, 753
Sampson, R., 5, 13, 156, 666, 672, 683, 693, 695, 698, 699, 701, 704, 705, 913, 914, 926
Samuelson, P. A., 553
Samuelson, S., 277
Sandblom, J., 604
Sandefur, G., 694
Sandel, T., 744, 746
Sanders, M. G., 922
San Doval, A., 919
Sanford, E. C., 573, 596
Sanford, N., 451
Sangsue, J., 370
Sanislow, C. A., 231
Sansone, L., 543
Santostefano, S., 53, 63
Sapolsky, R. M., 415, 438
Sarat, A., 874
Sarbin, T. R., 441
Sareen, J., 409
Sarigiani, P. A., 429
Sarkar, S., 222, 231
Sarris, E. G., 191
Sass, L. A., 750
Sato, T., 185
Satz, P., 614
Sauck, C., 176
Saudino, K. J., 32
Savage, A., 616
Savola, K. L., 5, 156, 668
Sawa, A., 702
Sawyer, R., 741
Saxe, G. B., 54
Saxe, R., 345
Sayer, A. G., 668, 685
Scales, P., 12, 895, 900, 901, 905, 906, 908, 911, 912, 913, 914, 915, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931
Scardamalia, M., 349
Scarlett, W. G., 953, 955, 974, 990
Scarr, S., 36, 43, 65, 234, 235, 247, 248, 519, 529, 606, 613, 614, 615, 619, 819, 846, 866
Scarr-Salapatek, S., 247, 819, 865
Schaal, S., 288
Schacter, D. L., 605
Schadewaldt, W., 610
Schaeffer, C. M., 917
Schaffer, H. R., 151, 153
Schaffler, P., 377
Schaie, K. W., 448, 527, 528, 551, 572, 573, 575, 583, 584, 587, 588, 589, 597, 598, 603, 610, 611, 612, 613, 644, 669, 904
Schallenberger, M. E., 106, 123, 135
Schank, R. C., 325, 372, 522, 524, 541, 542, 543
Schechtman, V. L., 725
Schecter, S. R., 743, 744
Scheff, T. J., 376
Scheibel, A., 385
Scheier, C., 53, 240, 246, 287, 299, 300
Scheier, M. F., 410, 522, 536, 537, 539, 540, 541, 543, 554, 620, 638, 639
Scherer, H., 590
Scherer, K. R., 370, 371
Scherer, M., 540
Scherer, U., 370
Schibilsky, M., 988
Schieffelin, B., 499, 738, 739, 743, 744
Schiff, M., 232
Schiller, J., 320
Schiller, K. S., 687
Schindler, I., 627, 628, 636, 638, 639
Schjelderup, H., 949
Schjelderup, K., 949
Schlick, M., 73, 74
Schlosberg, H., 374
Schmidt, G., 600
Schmidt, J., 468
Schmidt, K., 377
Schmidt, L. A., 415
Schmidt, L. R., 590
Schmidt, R. A., 296
Schmidtchen, G., 987
Schmidt McCollam, K., 447, 607
Schmiedek, F., 591, 597, 603
Schmitt-Rodermund, E., 670
Schmitz, B., 595
Schmitz, E., 987
Schmitz, U., 550, 554
Schnabel, K. U., 668
Schnakenberg, J., 945
Schneider, B., 506, 688
Schneider, E. L., 551
Schneider, K., 294, 296, 546
Schneider, S. K., 539
Schneider, W., 449, 478, 537, 605
Schneirla, T. C., 2, 26, 33, 46, 96, 121, 141, 217, 219, 225, 247, 265, 408, 415, 422, 423, 469, 471, 495, 574, 798, 903
Schoelmerish, A., 761
Schoenhals, M., 688
Schoenrade, P., 982, 984
Scholnick, E. K., 28, 62, 542
Scholz, J. P., 276
Schoneman, T. J., 789
Schöner, G., 53, 240, 246, 273, 276, 277, 298, 299, 300, 306
Schönpflug, U., 534
Schooler, C., 606, 739, 759
Schoon, I., 682
Schore, A. N., 377
Schorr, L. B., 932
Schoultz, J., 765
Schroeder, D. C., 183
Schroedter, T., 948, 964
Schrott, L. M., 417
Schuierer, G., 609

Schulenberg, J. E., 612
Schultheiss, O. C., 541
Schultz, D., 831, 847
Schultz, L. H., 376, 377
Schultz, P. G., 255
Schultz, W., 932
Schulz, R., 548, 552, 554, 578, 590, 620, 634, 636, 641, 904
Schulze, P., 761
Schunk, D., 536
Schurr, T. G., 227
Schütz, A., 199, 522
Schwartz, A., 983
Schwartz, C., 409
Schwartz, G. E. R., 630
Schwartz, J. C., 356, 372, 373, 374, 376
Schwartz, J. E., 623, 638, 652
Schwartz, J. H., 441
Schwartz, M. S., 341
Schwartz, N., 412
Schwartz, T., 718
Schwartzman, H., 741
Schwarz, B., 442
Schwarz, N., 539, 639, 640
Schweder, R. A., 413, 421, 441
Schweitzer, F., 946, 964, 981
Scott, J. P., 151, 152, 153
Scott, S., 989
Scribner, S., 200, 531, 738, 766
Scriven, M., 419
Scriver, C. R., 224
Searle, J., 32, 34, 56, 57, 524
Sears, H. A., 408
Sears, M. R., 684, 703
Sears, P., 146, 149, 574
Sears, R. R., 90, 91, 123, 125, 128, 144, 149, 150, 155, 574, 666, 693
Seaton, G., 831, 838, 871, 881
Secada, W., 768
Secord, P. F., 523
Segall, M. H., 721
Segalowitz, S. J., 415
Seibold-Simpson, S. M., 926
Seidel, F., 213
Seifer, R., 500
Seifert, A. E., 540
Sejnowski, T. J., 282
Seligman, M. E. P., 131, 423, 473, 540, 547, 638, 900, 901, 926, 932
Sells, S. B., 410, 422
Selman, R., 376, 377, 526, 533, 548, 549, 550
Selye, H., 415, 416
Semel, S., 501
Senders, S. J., 241
Senn, M. J. E., 125
Sesma, A., Jr., 901, 906, 908, 915, 924, 925, 927, 928, 929
Sethi, S., 860
Setiadi, B., 374
Settersten, R. A., Jr., 571, 573, 584, 586, 633, 674, 680, 697, 700, 924
Sewertzoff, A., 187
Sewney, V. D., 111
Seymour, B., 606
Seymour, S., 718
Shafranske, E. P., 948
Shahabi, L., 982
Shakow, D., 117
Shamakina, I. Y., 216, 247
Shanahan, L., 702
Shanahan, M., 170, 248, 449, 665, 666, 668, 671, 680, 682, 688, 693, 698, 701, 702, 703, 821
Shand, N., 756, 759
Shannon, L. W., 443
Shanon, B., 51, 56
Sharma, A., 12, 912, 920
Shatz, C., 215
Shaver, P., 320, 325, 356, 370, 371, 372, 373, 374, 376, 377, 979, 987
Shaw, J. C., 306
Shaw, L., 242
Shaw, R. E., 306
Shea, M. C., 537
Sheets-Johnstone, M., 53
Sheldon, K. M., 639
Shepard, B., 62
Sherkat, D. E., 978
Sherman, A., 982
Sherman, M., 127
Sherman, T., 545
Sherrill, K. A., 986
Sherrod, L., 586
Sherrow, F., 978
Sherry, D. F., 605
Sherzer, J., 742
Shiffrin, R. M., 478, 537
Shillito, E., 242
Shils, E. A., 522
Shimizu, H., 718, 759
Shimuzu, M., 702
Shinn, M., 164, 438
Shinn, P., 238
Shirk, S., 751
Shirley, M. M., 128, 135
Shishler, R. J., 601
Shoda, Y., 621, 623
Shore, B., 717, 718
Shostak, M., 184
Shrager, J., 602
Shrout, P. E., 279
Shucksmith, J., 429
Shultz, T. R., 348, 356, 357, 382
Shuman, A., 748
Shwalb, B. J., 743
Shwalb, D., 743
Shweder, R., 66, 67, 200, 519, 527, 576, 597, 717, 718, 719, 720, 721, 722, 723, 725, 726, 729, 732, 738, 739, 752, 753, 756, 760, 762, 768, 772
Siddle, R., 989
Siegal, M., 777
Siegel, A. W., 764
Siegler, I., 632, 985
Siegler, R. S., 28, 44, 45, 62, 72, 86, 100, 101, 303, 321, 325, 336, 352, 364, 365, 533, 582, 590, 603, 605, 775, 778
Siepmann, M., 35
Sigman, M., 500, 811
Sigvardsson, S., 441
Sijtsma, K., 30
Sikström, S., 600
Silbereisen, R. K., 24, 412, 427, 428, 442, 517, 670, 691
Silberg, J., 702
Silke, A., 988
Silva, P., 408, 628, 695
Silver, L. J., 831, 838, 881
Silver, R. C., 642, 687

Silverberg, S. B., 579
Silvern, L., 323, 344
Silverstein, S. M., 987
Simão, L. M., 200, 201
Simenova, D., 759
Simmel, G., 195
Simmonds, R., 978
Simmons, R. G., 683
Simmons, W. L., 554
Simner, M. L., 242
Simon, H., 191, 306, 338, 526, 610
Simon, T., 103
Simons, R. L., 428, 685, 696
Simonton, D. K., 471, 472, 484, 610
Simpson, A. R., 914
Singer, B., 637, 692, 918, 932
Singer, D., 5
Singer, J. D., 328, 359, 685
Singer, J. L., 620
Singer, M. I., 441
Singer, T., 577, 578, 584, 589, 598, 604, 606, 611, 615, 616, 617
Singer, W., 597, 628
Singh, G., 227
Singh, I., 328, 381
Sinnott, J., 492
Sjövall, B., 188
Skeels, H. M., 127
Skinner, B. F., 44, 47, 67, 131, 143, 150, 329, 338, 363, 364, 521, 605, 903
Skinner, D., 745, 748, 749
Skinner, E. A., 436, 547, 548, 554, 635
Skorpen, C. G., 630
Skrondal, A., 5, 156
Slaughter, D. T., 849
Slaughter, V., 975
Slee, N., 958, 959
Sliwinski, M. J., 668
Sloane, D. M., 979
Slobin, D., 344, 745
Slomczynski, K. M., 815
Slomkowski, C., 777
Slotta, J. D., 263
Slovak, K., 441
Slunecko, T., 185
Slutske, W. S., 702
Sluyter, F., 227, 228
Small, B. J., 632, 633
Small, S., 803, 805, 806, 898, 901, 905, 906
Smedslund, J., 173, 176, 532, 533
Smith, C., 408, 540, 981
Smith, E. E., 537
Smith, F., 612
Smith, J., 11, 408, 473, 491, 493, 530, 542, 550, 569, 571, 574, 575, 577, 581, 582, 585, 590, 591, 593, 594, 597, 604, 606, 607, 608, 611, 612, 614, 621, 625, 630, 634, 635, 636, 637, 638, 642, 644
Smith, K., 925
Smith, L., 39, 53
Smith, L. B., 156, 195, 240, 243, 246, 259, 271, 275, 277, 278, 284, 287, 289, 291, 292, 299, 300, 301, 302, 303, 306, 332, 347, 348, 357, 605, 607, 622, 903
Smith, L. D., 44, 73
Smith, M. A., 820
Smith, M. B., 698
Smith, M. J., 524
Smith, M. R., 616
Smith, R. S., 697, 905
Smith, S., 320, 761
Smith, T. J., 906, 913, 927
Smith, W. C., 954, 962, 986
Smoller, D., 242
Smyth, M., 174
Smythe, W. E., 174, 199
Sneed, J. D., 531, 532
Snell, E., 689
Snibbe, A. C., 761
Snidman, N., 378, 438, 442, 623
Snow, C., 325, 344
Snyder, C. R., 538, 539
Snyder, M., 438, 537
Snyder, S. H., 702
Snyder, S. S., 552
Soares da Silva, A. P., 202
Sofer, C., 680
Sokol, B. W., 27
Sokoloff, H., 896
Sokolowski, M. B., 223, 224, 226, 228, 229, 230
Solaas, M. H., 819
Solomon, B., 190
Solomon, G. E. A., 61
Solomon, J., 377
Solomon, R. L., 131, 423
Somsen, R. J. M., 388
Sorell, G. T., 436
Sorensen, A. B., 586, 687
Sorensen, S., 415
Soto-Faraco, S., 242
Sousa, P., 777
Sovran, T., 187
Sowarka, D., 580, 603, 612
Spalding, D. A., 95
Spangler, G., 739, 740, 757
Spanoudis, G., 343, 353
Spaulding, W., 634
Spear, L. P., 420
Spear, N., 242
Spearman, C., 235
Speed, W. C., 227
Speer, J. R., 548
Spelke, E., 5, 33, 61, 241, 263, 278, 315, 325, 338, 339, 340, 342, 344, 345, 346, 348, 353, 372, 604, 605, 777
Spelt, D. K., 131
Spemann, H., 140
Spence, C., 242
Spence, D. P., 745
Spence, J., 240, 485
Spence, M. J., 232
Spencer, A. E., 980
Spencer, H., 93, 196
Spencer, J., 293, 294, 295, 296, 297, 299, 302, 306
Spencer, M. B., 8, 379, 830, 831, 832, 833, 834, 835, 838, 839, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 876, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 905, 913
Spencer, T., 831, 887
Sperber, D., 776
Sperry, D. E., 746, 748
Sperry, L. L., 744, 746, 748

Sperry, R. W., 217, 247
Spiegel, D., 628, 629, 630
Spilerman, S., 681
Spilka, B., 944, 945, 948, 952, 953, 974, 975, 977, 978, 980, 984, 988, 990
Spilka, G., 932
Spiro, A., III, 632, 640
Spiro, M. E., 379
Spivey, M., 284, 287, 288
Spock, B., 145
Spoont, M. R., 629
Spranger, E., 520, 521
Spring, B., 424
Spruston, N., 320
Spudich, J. L., 225
Sroufe, L. A., 24, 27, 62, 370, 377, 432, 482, 501, 815, 816, 915
Srull, T. K., 544
Stace, W. T., 35, 55
Staff, J., 682
Standing, E. M., 504, 505
Stanger, C., 751
Stangor, C., 549
Stanley, J. C., 349
Stansfeld, S., 684
Stanton, B., 930
Stanton, J. M., 620, 634, 638
Stanton, W., 695
Stark, R. A., 953
Stattin, H., 7, 11, 14, 36, 37, 39, 49, 401, 406, 408, 410, 411, 415, 425, 426, 427, 428, 430, 432, 450
Staudinger, U., 11, 167, 405, 416, 419, 552, 569, 570, 572, 577, 578, 579, 583, 585, 587, 596, 597, 598, 605, 606, 607, 608, 609, 610, 614, 618, 619, 620, 622, 625, 627, 628, 631, 633, 634, 635, 636, 637, 638, 639, 641, 644, 669, 904, 944
Stavy, R., 778
Stearns, E., 703
Stearns, P. N., 177
Stecher, L. I., 126
Steedman, C. K., 749
Steele, C., 538, 749, 834, 839, 845, 846, 848, 853, 870, 871, 881
Steele, S., 946
Stefancic, J., 875, 876, 877, 878
Stein, B. E., 240, 244, 283
Stein, J., 35, 920
Stein, K., 757
Stein, M. B., 409
Stein, S. A., 323
Steinberg, L., 1, 7, 10, 33, 36, 44, 426, 817, 818, 893, 901, 915
Steinhagen-Thiessen, E., 11, 615
Stenberg, C., 321
Stengers, I., 269, 582
Stent, G. S., 222
Stepanova, A. N., 238
Stern, D., 751
Stern, D. C., 420
Stern, D. M., 494, 499, 500
Stern, M. S., 995
Stern, W., 2, 37, 40, 118, 119, 248, 406, 421, 425, 438
Sternberg, P. W., 436
Sternberg, R. J., 28, 44, 62, 353, 413, 475, 492, 506, 537, 579, 578, 600, 605, 606, 608, 613, 618, 622
Sterns, H. L., 644
Stetsenko, A., 442, 757
Stevens, A. H., 682
Stevenson, H. C., 834, 845, 846, 867, 870
Stevenson, H. W., 151, 756, 790
Stewart, J., 187, 199, 315, 319, 320, 324, 325, 330, 332, 334, 365, 366, 367
Stewart, M., 978
Stigler, J. W., 717, 718, 756, 761
Stigsdotter, A., 612
Stock, W. A., 551
Stodolsky, S., 848
Stoler, A. L., 883
Stoltzfus, J., 845, 881, 887
Stolz, L. M., 698
Stone, A., 546
Stone, M., 989
Storch, K.-F., 238
Stouffer, S. A., 698
Strack, F., 539, 640
Strang, P., 589
Stratton, P., 179
Strauman, T., 538, 545
Strauss, A. L., 672
Strauss, B., 242
Strauss, S., 361, 533
Strawbridge, W. J., 982
Streib, H., 960, 988
Strelau, J., 623
Streri, A., 241, 245
Strickland, B. R., 761
Strohman, R. C., 249
Stromberg, P. G., 749
Strommen, M. P., 977
Stronks, K., 684
Strout, S., 179
Strycker, L. A., 685
Stryker, M. P., 437
Stryker, S., 551
Stuart, J. M., 237
Stueve, A., 919
Stumpf, C., 409
Su, Y., 945, 984
Suci, G. J., 327, 374
Suess, G., 739, 740, 757
Suess, P. E., 629
Sugarman, S., 26
Sugden, K., 233, 705
Suh, E., 630
Sullivan, H. S., 37, 145, 150, 751
Sullivan, M., 66, 200, 718, 721, 751, 837
Sullivan, T. K., 913, 914
Sullivan, W. M., 755, 756
Sulloway, F. J., 93, 94, 95, 115, 668, 682
Sully, J., 111, 114, 119
Suls, J., 641
Sundet, J., 819
Suomi, S. J., 1, 53, 152
Super, C., 449, 526, 717, 737, 738, 763, 766
Surwit, R. S., 231
Susman, E. J., 408, 415, 622, 686
Sutton, K. J., 635, 640
Sutton-Smith, B., 508, 833
Svanborg, A., 629
Swann, W. B., 538, 553
Swann, W., Jr., 538
Swanson, C. C., 179

Swanson, D., 831, 842, 843, 850, 858, 859, 867, 869, 870, 871, 876, 887
Swanson, K. R., 179
Sweeney, M. M., 703
Swidler, A., 755, 756
Swijtink, Z., 172
Sylva, K., 507
Symons, L. A., 241, 242, 245
Szeminska, A., 342

Tabor, L. E., 348
Taine, H., 97
Tajfel, H., 771
Takagi, S., 702, 706
Takagi, T., 387
Takahashi, K., 776
Takanishi, R., 895, 899
Takata, T., 760
Tambs, K., 819
Tamis-LeMonda, C. S., 759
Tamminnen, K., 958, 964, 972, 973, 974
Tanabe, H., 768
Tang, Y.-P., 255, 702
Tangney, J. P., 371, 372
Tannenbaum, P., 327, 374
Tanner, J. M., 417
Tanner, L., 233
Tapaswi, P. K., 261
Tarafodi, R. W., 758
Tatarkiewicz, W., 555
Tatsuoka, M. M., 334
Taub, E., 609
Taylor, A., 233, 684, 703
Taylor, B., 415
Taylor, C., 23, 24, 48, 63, 72, 75, 79, 539, 540, 752, 951
Taylor, C. E., 747, 748
Taylor, C. S., 930
Taylor, E., 466, 501
Taylor, H. F., 233
Taylor, M., 741
Taylor, S. E., 365, 538, 542, 554, 639
Teasdale, E. J. D., 547
Teasley, S. D., 587
Tecott, L. H., 223
Tees, R. C., 245
Tees, R. L., 241, 242, 244
Teichmann, H., 417
Teitge, D. W., 749
Teitge, J. S., 749
Tellegen, A., 919, 924
Terman, L. M., 103, 127, 128, 821
Terr, L. C., 380
Tesch-Römer, C., 415, 609
Tesla, C., 777
Tesman, J. R., 62
Tesser, A., 362, 537, 541, 555
Tetens, J. N., 421, 518, 570, 571, 572, 574, 600, 618
Tetlock, P. E., 768, 770
Thalberg, J., 517, 523
Thaler, D. S., 597
Thatcher, R. W., 281, 348, 382, 383, 386, 387, 388, 389
Thelen, E., 27, 39, 53, 54, 134, 156, 195, 240, 243, 246, 259, 271, 275, 276, 278, 284, 286, 289, 290, 291, 292, 293, 294, 295, 296, 297, 299, 300, 301, 302, 303, 304, 306, 332, 347, 348, 356, 357, 408, 430, 605, 606, 622, 903
Theokas, C., 6, 12, 13, 895
Thielman, S. B., 986
Thieman, T. J., 102
Thoits, P. A., 688, 772
Thom, R., 261
Thomae, H., 417, 438, 526, 569, 573, 636
Thoman, E. B., 725
Thomas, A., 477, 491, 493, 526, 623, 905
Thomas, D., 126, 135, 136, 739
Thomas, K., 832, 867
Thomas, M. S. C., 279
Thomas, S. A., 238
Thomas, W. I., 135, 422, 471, 667, 669, 673, 678, 692
Thompson, E., 46, 47, 53, 69, 246, 303, 466, 750
Thompson, H., 132, 414
Thompson, L., 585, 614, 615
Thompson, R. A., 412
Thompson, R. F., 101
Thompson, S. C., 423, 553
Thompson, W. W., 616
Thomson, W. M., 684, 703
Thoresen, C. E., 915, 923, 982
Thorndike, E. L., 95, 137
Thorne, B., 771, 774
Thorngate, W., 183
Thornton, A., 668, 676
Thouless, R. H., 974
Thun, T., 973
Thurman, R., 969
Thurstone, L. L., 137
Tian, H. J., 233, 239
Tice, D. M., 544
Tiedemann, D., 164
Tienda, M., 688
Tierney, P., 917
Tinbergen, N., 96
Tinker, E., 24, 50
Tipper, S. P., 555
Tipton, S. M., 755, 756
Tiret, L., 230
Titzer, R., 275, 284, 291, 299, 300, 301, 306
Tobach, E., 2, 7, 10, 36, 46, 156, 415, 469, 495, 518, 763, 798
Tobin, J., 748, 756
Todd, J., 293
Todd, P. M., 596, 605
Todd, R. D., 437
Todorov, A. A., 702
Tokoro, M., 776
Tolan, P. H., 926
Tolman, E. C., 131, 143, 220, 409
Tolman, J., 906, 920
Tomarken, A. J., 629
Tomasello, M., 311, 412, 575, 576, 597, 750, 751, 762, 777, 778
Tomiyasu, U., 385
Tomkiewicz, S., 232
Tomkins, S., 441
Tomlinson, W. T., 242, 245
Tomlinson-Keasey, C., 623, 638
Toms, F., 835, 857
Tononi, G., 38, 48, 410
Tonooka, R., 192
Tooby, J., 41, 623
Toomela, A., 192, 199, 200
Topoff, H. R., 7
Törestad, B., 219, 249, 404, 405, 413, 423, 445, 449, 587, 589, 611

Toth, S. L., 317
Toulmin, S., 56, 59, 74, 75, 524, 527
Touwen, B. C. L., 348
Toynbee, A., 472
Trabasso, T. R., 278
Tracy, J. L., 49, 412
Tran, V., 370
Traupmann, K., 770
Trause, M. A., 839, 844
Treboux, D., 377
Tremblay, R. E., 447, 685
Tretjakoff, I., 223
Trevarthen, C., 439, 500, 507
Triandis, H. C., 730, 753, 755, 757, 860
Triandis, L., 980
Trickett, E., 13
Triplett, R. A., 682
Trivers, R. L., 624
Tronick, E. Z., 735, 791
Trost, M. A., 427
Trudeau, E. J., 323
Trudewind, C., 546
Trueba, H. T., 881, 882
Truly, T. L., 196
Tryon, W. W., 12
Tsai, J., 631, 759
Tsay, J. C., 905
Tsien, J. M., 702
Tsien, J. Z., 235, 236, 702
Tu, W., 753
Tucker, D., 248, 492
Tucker, J. S., 623, 638, 653
Tucker, S. R., 831, 838, 881
Tuholski, S. W., 602
Tulkin, S. R., 811
Tuma, S., 589
Turbin, M. S., 901, 921, 923
Turiel, E., 343, 533
Turkewitz, G., 242, 243, 245, 247, 283, 469
Turkheimer, E., 613
Turnball, R., 407
Turnbull, W., 540
Turner, P., 816, 905
Turner, R. J., 703
Turvey, M., 273, 274, 306
Tyler, S. A., 522
Tyson, R., 179
Udry, J. R., 930
Uhlenberg, P., 670
Ullman, C., 987
Ulrich, B. D., 27, 259, 290
Ulrich, B. O., 240
Ulvund, S. E., 613
Umerez, J., 178
Unzner, L., 546, 739, 740, 757
Updegraff, R., 127
Urbano, R., 245
Uttal, D. H., 35
Uvnäs-Moberg, K., 416
Uzgiris, I. C., 345, 350, 384, 387

Vaidya, J. G., 632
Vaihinger, H., 199
Vaillant, G., 469, 637, 644, 666
Valdivieso, R., 932
Valentine, J. C., 926
Valiant, G., 376
Vallacher, R. R., 362, 447, 541
Valle, V. A., 546
Valsiner, J., 5, 20, 21, 27, 28, 38, 63, 65, 90, 108, 109, 112, 113, 114, 130, 156, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 182, 183, 184, 185, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 206, 247, 248, 356, 405, 413, 449, 517, 522, 526, 535, 545, 546, 549, 576, 597, 644, 751, 772, 774
van Aken, M. A. G., 352
van de Mheen, H., 684
Vandenberg, B., 508
Vandenbergh, J., 218
van der Lans, J., 988
van der Lippe, T., 673
van der Maas, H., 290, 320, 347, 357, 362
Van der Meulen, M., 751
van der Molen, M. W., 388, 601
Vanderryn, J., 921
van der Veer, R., 63, 65, 90, 108, 109, 112, 113, 156, 170, 175, 187, 188, 189, 190, 191, 199, 200, 247, 248, 522
van der Weele, C., 231
Van Deusen-Phillips, S. B., 745, 765
VanDevender, T., 735
van Dijk, L., 673
van Dijk, M., 320, 323, 329, 348
Vandiver, B. J., 889
van Dulmen, M., 925
van Geert, P., 170, 195, 291, 315, 320, 323, 329, 347, 348, 351, 352, 356, 357, 358, 359, 360, 362, 382, 383, 384, 387, 447
van Gelder, T., 320
Van Heck, G. L., 406, 422
van Heerden, J., 431
VanLaningham, J., 682
van Leeuwen, H. M. P., 388
van Lieshout, C. F. M., 419
Van Nguyen, T., 428, 813
van Os, J., 702
Van Parys, M., 329, 334, 349, 378, 379
van ‘t Klooster, B. J., 388
Van Tol, H. H. M., 227
Vapnarsky, V., 777
Varela, F., 46, 47, 53, 69, 246, 303, 466, 520, 582, 750
Vazsonyi, A. T., 929
Velasquéz, O., 765
Venter, J. C., 7, 9
Ventis, W. L., 982, 984
Ventura-Cook, E., 761
Vereijken, B., 279
Verhaeghen, P., 598, 601, 604, 611, 615, 616, 617
Verma, A., 680
Veronneau, S., 238
Verschure, P. F. M. J., 357
Vicary, J. R., 429
Vico, G. B., 520
Vidal, F., 998
Viitanen, M., 612
Viken, R. J., 428
Villa-Komaroff, L., 217
Villareal, M., 753
Villarruel, F. A., 13, 898, 900
Villenas, S., 183
Vinden, P. G., 765
Vinsel, A., 488
Virshup, L. K., 772

Vishton, P., 604
Viswanathan, N., 238
Viteles, M. S., 118
Vogel, P., 973
Vogler, G. M., 702
Volet, S., 412
Volkart, E. H., 667
von Baer, K. E., 91, 92, 93, 187, 211, 212
von Bertalanffy, L., 2, 32, 93, 94, 141, 214, 215, 257, 268, 269, 347, 357, 434
von Cranach, M., 522
Vonèche, J. J., 111
von Ehrenfels, C., 185
von Eye, A., 5, 156, 426, 442, 446, 447, 464, 529, 930
von Hofsten, C., 292, 293, 604
von Knorring, A.-L., 441
von Oertzen, T., 589, 591, 603, 606
Von Uexküll, J. J., 179
von Wright, G. H., 51, 75, 76, 79
Voss, T., 947
Voyat, G., 198
Vraa, R., 911, 913, 914, 929
Vrba, E. S., 605
Vreeke, G. J., 32
Vroom, V. H., 522
Vuyk, R., 198
Vygotsky, L., 26, 60, 66, 113, 139, 140, 186, 191, 192, 199, 200, 288, 292, 303, 321, 330, 332, 349, 363, 364, 421, 496, 501, 508, 519, 522, 526, 546, 553, 598, 603, 669, 743, 761, 911

Wachs, T. D., 223, 233, 423, 814, 815, 820
Waddington, C., 99, 141, 194, 247, 260, 261, 268, 276, 417, 582, 592
Wadsworth, M., 683, 692
Wagner, D., 539
Wagner, R. K., 537, 606
Wahl, H.-W., 579, 590
Wahlsten, D., 39, 223, 224, 225, 226, 227, 228, 229, 230, 231, 234, 235, 323, 341, 347, 416, 702, 903
Wainwright, P., 228
Waismann, F., 532
Walberg, H. J., 923
Waldron, M., 614
Waldrop, M., 470, 482
Walker, L., 982, 984
Walker, S., 959, 970
Walker-Andrews, A. S., 241, 243
Walker-Andrews, A. W., 284
Walkerdine, V., 791
Wall, S., 153, 377, 384, 740, 815
Wallace, D. C., 227
Wallace, J. G., 339, 346, 364
Wallbott, H. G., 371
Wallon, H., 143, 189, 366
Walters, L. H., 915
Walters, R. H., 149, 150, 151, 572
Wamboldt, F. S., 441
Wandersman, A., 901, 915, 932
Wang, L., 332, 354, 356, 372, 375
Wang, M. C., 923
Wang, P. P., 213, 214
Wang, Q., 746, 757, 759
Wang, S.-H., 722, 742, 778
Wang, X., 741, 746
Wapner, S., 39, 69, 70, 432
Warburton, D. M., 407
Ward, M. C., 499
Ward, R. A., 553
Warr, P., 602
Warren, D. H., 242
Warren, H. C., 101
Warren, J. R., 688
Warren, N., 531
Wartofsky, M., 56, 59, 70, 534
Warwick, L., 988
Washburn, R. W., 134
Wasserman, S., 278
Watanabe, A., 387
Watanabe, J., 759
Watanabe, K., 169, 192
Waterman, A. S., 620, 622, 633
Waters, E., 153, 377, 384, 740
Waters, I., 815
Waters, P. J., 224
Watkins, J. W. N., 529
Watkins, L. R., 435
Watson, D., 492, 632
Watson, J., 777
Watson, J. B., 2, 91, 121, 129, 130, 131, 165, 171, 403, 405, 521
Watson, J. S., 545
Watson, M. W., 335, 378, 379
Watson-Gegeo, K. A., 743, 744, 766, 769
Watt, L. M., 551
Watts, C. L., 376
Wax, N., 778
Way, N., 924
Wayment, H. A., 639
Weakland, J. H., 145
Weaver, L., 620, 635
Webb, A. G., 612
Webb, K. S., 881
Webster, P. S., 552
Wechsler, A., 385
Wegner, D. M., 541
Weigert, A. J., 749
Weiler, I. J., 235
Weinberg, R. A., 898, 902, 905
Weinberger, D. R., 604
Weiner, B., 534
Weiner, H., 436, 437
Weinert, F. E., 582, 586, 605
Weinstein, H., 756, 758
Weir, M. W., 583
Weismann, A., 218
Weisner, T., 717, 725, 727, 736, 738, 762, 773
Weiss, C. H., 932
Weiss, M., 751
Weiss, P., 181, 215
Weissberg, R. P., 901, 926, 932
Weisz, J., 547, 552, 759
Welch, R. B., 242
Welford, A. T., 321, 601
Weller, S. C., 774
Welles-Nystrom, B., 737
Wellman, B. L., 127
Wellman, H. M., 301, 343, 548, 597, 600, 605, 609, 775, 776, 777
Wells, A., 481, 916
Wells, L. E., 551

Wenger, E., 546, 770
Wenger, M., 735
Wenger Jindra, I., 964
Wentura, D., 541, 548, 551, 552, 554, 555, 570, 593, 620, 637, 638
Wentzel, K., 504
Werboff, J., 152
Werker, J., 728, 740
Werner, E. E., 621, 697, 905
Werner, H., 27, 37, 40, 60, 93, 118, 189, 190, 364, 383, 580, 603, 634, 635
Wertlieb, D., 156, 169, 918
Wertsch, J., 31, 38, 66, 200, 201, 322, 494, 522, 526, 546, 717, 742, 743, 748, 765, 769, 774
West, C., 883
West, D. D., 898
West, D. J., 695
West, M., 265, 290, 738
West, M. J., 218, 266
West, M. M., 356
Westen, D., 327
Westerhof, G. J., 620
Weston, D. R., 816
Wethington, E., 807, 821, 822, 823, 824
Whalen, S., 481, 497, 502
Wheaton, B., 687, 701, 703
Wheeler, L. R., 127
Wheeler, R. E., 629
Wheeler, S., 569, 571, 573
Whitbourne, S. K., 620, 633
White, B., 734
White, G., 717, 718
White, K., 932
White, L. K., 682
White, M. I., 754
White, R., 146, 422, 546, 621, 837, 838, 841, 842, 845, 870
White, S., 45, 90, 91, 104, 105, 107, 155, 573, 741, 764, 854, 855, 856, 859, 869, 870
Whitelaw, E., 225
Whiteman, R., 409
Whiting, B. B., 149, 321, 356, 364, 735, 738, 739
Whiting, J. W. M., 149, 719, 725, 732, 735, 738, 739
Whitlock, J. L., 927, 931
Wibowo, S., 758
Wickens, C. D., 131
Wickens, D. D., 131
Wicklund, R. A., 537, 538, 540, 553
Wiedl, K. H., 603
Wienbruch, C., 609
Wierzbicka, A., 718, 722, 732
Wiese, B. S., 595
Wiesel, T. N., 382, 422, 424
Wiesner, M., 670, 725
Wigfield, A., 12, 410, 429, 503
Wiggins, R. W., 682
Wilensky, H. L., 684
Wiley, A., 745, 746, 759
Wiley, E. O., 46
Wilkening, F., 605
Willett, J. B., 5, 156, 328, 357, 359, 589, 685
Williams, D., 683
Williams, E. M., 54
Williams, H. M., 127
Williams, K., 741, 746, 749
Williams, R. M., Jr., 698
Williams, R. N., 436
Williams, R. W., 224
Williams, S., 630, 925
Williams, W. M., 606
Williamson, P. A., 492
Willis, P., 770
Willis, S. L., 575, 584, 585, 590, 597, 598, 604, 611, 612
Willis, S. W., 584
Willitts, M., 684
Willmott, P., 673
Wills, C., 432
Wills, T. A., 539
Wilmington, D., 245
Wilson, E. O., 95, 141, 247, 337, 945
Wilson, G., 247
Wilson, J., 323, 332, 351, 352, 429
Wilson, M., 323, 425, 426
Wilson, R. S., 235
Wilson, S., 761
Wilson, S. G., 235
Wilson, S. M., 929
Wilson, W. H., 183
Wimmer, H., 975
Winant, H., 882, 883, 884
Winch, P., 75, 524
Winegar, L. T., 176, 195
Winer, B. J., 32
Wingard, D. L., 623, 638
Wink, P., 633, 638, 998
Winn, S., 735
Winnicott, D. W., 37, 54, 60
Wisden, W., 216, 247
Wispé, L., 199
Witasek, S., 199
Witherington, D., 384
Witter, R. A., 551
Wittgenstein, L., 19, 35, 75, 80, 175, 341, 373, 535
Wittkowski, J., 974
Wohlwill, J., 22, 94, 114, 334, 346, 351, 357, 417, 423, 833
Wolf, M., 335, 980
Wolf, S. A., 745, 749
Wolf, T. H., 100, 101
Wolfer, D. P., 238
Wolff, P. H., 259, 432
Wolfram, S., 362
Wollheim, R., 551
Wolpert, L., 260
Wong, A. H. C., 227
Wong, P. T. P., 551
Wong, W. H., 238
Wood, D., 498, 545
Wood, I. C., 216
Wood, J. V., 640
Wood, P. K., 332, 351, 358, 386
Woodcock, R. W., 583
Woodruff, D. S., 640
Woodson, C. G., 879
Woodward, K. M., 630
Woolever, C., 981
Woolley, J., 975
Wortham, S., 745, 748
Wortman, C. B., 553, 642, 687
Wozniak, R., 466, 501
Wozniak, R. H., 535
Wozniak, R. J., 90, 108, 109, 111, 121

Wranik, T., 370
Wright, H. F., 833
Wright, R. A., 544, 553
Wright, S., 216
Wrosch, C., 635
Wu, D. Y. H., 756, 759
Wu, S., 356, 373, 374, 376
Wu, W., 821
Wugalter, S. E., 446
Wulff, D. M., 944, 945, 947, 948, 966, 967
Wunderle, G., 947
Wundt, W., 91, 121, 166, 374, 414
Wurf, E., 619, 620, 750
Wyer, R. S., Jr., 544
Wyndhamn, J., 765
Wynn, J., 911
Wynne, L. C., 131
Wynshaw-Boris, A., 223

Xie, H., 154, 155
Xie, Y., 323, 332, 351, 352
Xuei, X. L., 233, 239

Yakovlev, P. I., 385
Yamakoshi, G., 192
Yamamoto, Y., 831
Yamauchi, B., 305
Yamauchi, N., 387
Yan, Z., 187, 199, 291, 315, 319, 320, 324, 325, 330, 332, 334, 365, 366, 367
Yang, K.-S., 717
Yarrow, M. R., 150, 157
Yasumatsu, N., 235
Yates, E., 576
Yates, K., 261
Yates, M., 776, 919, 920, 945, 984
Yi, S., 759
Yip, T., 772
Yoerger, K., 695
Yohalem, N., 906
York, P., 441
Yorke, J. A., 277
Young, C. H., 5, 156, 668
Young, K., 127
Young, M. D., 673
Young, N. F., 881, 882
Youngblade, L., 777
Youngblood, J., 831, 887
Young-DeMarco, L., 668
Younger, B. A., 470
Youniss, J., 63, 67, 682, 776, 917, 919, 920, 945, 984
Yu, C., 287, 305
Yu, E., 835
Yu, H. C., 772
Yurko, K. H., 638
Yushak, M., 438
Yust, K.-M., 981
Yuwiler, A., 415
Yuwiler, J., 415

Zacks, R. T., 601
Zaff, J., 918, 925
Zahn-Waxler, C., 89, 573, 669, 707
Zajonc, R. B., 63, 423
Zank, S., 590
Zazzo, R., 143
Zecevic, N., 382, 384, 385
Zeigarnik, B., 194
Zelazo, P. D., 53
Zeldin, S., 902, 906, 913, 918
Zélény, M., 520
Zeligs, D. F., 949
Zelinski, E. M., 575, 584, 594
Zenderland, L., 105
Zenklusen, B., 964
Zernicke, R. F., 294, 296
Zetterblom, G., 425
Zhang, J. H., 409
Zhang, Y., 226
Ziegler, G., 438
Zigler, E., 2, 14
Zimbardo, P. G., 438
Zinnbauer, B. J., 953
Zins, J. E., 926, 932
Zirkel, S., 541
Zittoun, T., 183, 201
Zivin, G., 519, 546
Zlatev, J., 288
Znaniecki, F., 471, 667, 669, 673, 678, 692
Zoghbi, H. Y., 225
Zohar, A., 45, 72
Zondag, H. J., 964
Zondermann, A. B., 637
Zuckerman, M., 623
Zukow-Goldring, P., 240
Zulehner, P., 945
zur Oeveste, H., 446
Zweig, J. M., 923

Subject Index

Abduction, 64
Abduction-transcendental argument, 77–80
Abused children, developmental pathways, 380
Academic/school success, 881–883, 917
Accentuation dynamic, 691
Accommodative processes, 198, 478, 553–555
Action, 51–53, 516–556. *See also* Dynamic development of action and thought
  concepts, 521–527
  conceptual constituents, 522–524
  constitutive rules, 524
  constraints of, 524
  context of, 526–527
  control-system theories of, 522
  cultural regulation of development, 518–519
  developmental diversity and regularity, action-theoretical reconstructions, 527–535
    construction and deconstruction of developmental coherence, 528–529
    developmental plasticity, 529–530
    invariance and universality in development, 530–535
    weak and strong constraints, 529–530
  experience and, 52–53
  explicating, 522–524
  historical notes, 520–521
  intentional self-development and personal control over development, 535–544
  intention/behavior and, 51–53
  motivational theories, 522
  overview/introduction, 555–556
  personal control over development, 544–555
    action resources and perceived control, 548
    developing sense of control and personal agency, 547–548
    development of control-related beliefs/motivations, 546–548
    intentional action, developmental aspects of, 545–546
    intentional self-development and the developing self, 548–551
    preserving personal continuity and identity: assimilative and accommodative processes, 551–555
  personal regulation of developmental processes, 519–520
  polyvalence of, 524–526
  regulative rules, 524
  rise of perspective on human development, 516–521
  social-constructivist concepts; activity theory, 522
  structural theories of, 521–522
Act psychologists, 409
Adaptation:
  and appraisal, 371
  emotion and, 371
  selective; development as, 580–582
Adaptation level theory, 423
Adaptive capacity, development as change in, 580–584
Adolescence:
  academic/employment outcomes, 851
  African American males, 857–859
  antisocial behavior limited to, 685
  parenting, 496–498
  transitions to parenthood during adolescence, 685–686
Adultomorphic perspective, 26
Affective state, and developmental sequences, 334
African Americans:
  academic achievement research, 881–883
  achievement gap, 878–883

African Americans *(Continued)*
achievement motivation, historical overview, 879–880
AHAANA (Asian, Hispanic, African American, and Native American), 833, 834
cultural context, 856–857
social movement for education, 880–883
unique experience, male adolescents, 857–859
Age:
advanced (*See* Older adults)
cohorts, 675–677
life course and, 673–679
as marker of maturation rate, 417–418
positive youth development, 928–929
temporality and, 669
Agency:
action theory, and development of sense of personal, 547–548
child as active agent, 21
interaction and, 318–319
living systems as agentive, 318
person-agent, 50–51, 53–54, 409
principle of human agency, 692–694
Agency/communion (polar dimensions of complexity), 485
AHAANA (Asian, Hispanic, African American, and Native American), 833, 834
Alcohol, tobacco, or drug (ATOD) use, 925
Allocation of resources in personality functioning, 625
Analogy as mechanism of development, 45
Animal models and molecular genetics, 223–224
A-not-B task, 287, 299–303
Anticipatory preadaptation, 197–198
Antisocial behavior:
adolescence-limited, 685
biology and, 415
early onset, 695
life-course persistent, 685
Anxiety, experiential perspective, 472
Appraisal, in emotion, 371
Approach/avoidance goals, personality development, 631
Approach/withdrawal theory, 469
Argument from precocity, 344–345
Arousal reversals, 479
"As-if" structures unfolding in time, 198–199
Assimilation/assimilative activity, 198, 478, 552–553
Associative competition as mechanism of development, 45
Atomism, 30, 31, 57
Attachment, 151–153, 376–378, 500–501, 740, 979–980
Attractors, 196, 272–274, 289
Attributions, religious, 990
Attunement, 729
Authoritarian regimes, 472
Autopoietic systems, 181–182

Bean bag concept of genome, 42
Becoming/being, 56
Behavior:
expressive-constitutive and instrumental-communicative functions, 22–25, 28
fossilization of, 195
holistic-interactionistic model, 414
Behavioral ecology, 44
Behavioral/emotional development, historical perspective, 126, 129–132
Behavioral genetics and life course, future directions, 705–706. *See also* Genetics
Behavioral indicators of life mechanics of personality, 629–631
Behavioral inheritance, cultural psychology, 719, 720
Bimanual coordination, 297–298
Bioecological model of human development, 793–825, 864–868
defining properties, 796–799
developmental assessment of, 824–825
environmental dynamics:
in infancy, 809–810
in old age, 808–809
expanding ecological universe, 818–819
experience, 796–797
experiments, 808–810
microsystem, 814–820
mother-infant dyad as a context of development, 815–817
nature-nurture and, 819–820
overview/introduction, 793–796
person characteristics and later development, 810–813
demand characteristics, 812–813
developmentally generative dispositions inlife-course perspective, 810–812
force characteristics, 810–811
resource characteristics, 812
physical environment, and psychological development, 814–815
process, 795
proposition I, 797–798
proposition II, 798–799, 800–801

proximal processes, 795
focus of attention in proximal processes, 813–814
in solo activities with objects and symbols, 814
PVEST (phenomenological variant of ecological systems theory) and, 864–868
diagram, 864
ecological systems theory, 865–868
research design and, 799–810
developmental science in discovery mode, 801–803
dysfunction versus competence, 803–808
from research to reality, 822–824
time:
micro-, meso-, and macrochronological systems, 820–822
proximal processes, 795
Biological constraints, dynamic systems, 305
Biological constructivism, 65
Biological determinism, 43
Biological embodiment, 48–49
Biological models:
holistic interactionistic model, 435
life course and, 701–706
Biological roots, developmental psychology, 92
Biological standpoint, nature-nurture example, 36
Biology. *See also* Developmental psychobiological systems view:
antisocial behavior and, 415
cerebral asymmetry, 629–630
co-evolution, culture, 575–578
intellectual development, life span and, 595–619 (*see also* Cognitive development)
life span development and, 575–578, 595–619
neuroscience/brain, 305–306, 382–389, 602, 628–630
personality development and, 623–625
person-environment interaction processes, 414–416
well-being and, 415–416
Bio/social interactionism, 43
Board of Education v. Dowell, 872
Boredom, 472, 483
Boundaries/expectations, positive youth development and, 907
Brain/neuroscience, 305–306, 382–389, 602, 628–630. *See also* Biology
Bridging, 368–370, 498
Brown v. Board of Education, 868–872, 874

Career:
lines, 681
trajectories of marriage and parenthood, 684–685
Cartesian dualist framework, 337–338
Causality:
action patterns and, 76–77
developmental, coaction, 218–219
holistic-interactionist model, 435–436
split mechanical explanation, 72
systemic, in biological and psychological worlds, 180–182
Causal models, metatheoretical level, 435
biological model, 435
environmentalistic model, 435
mentalistic model, 435
Cautiousness, balance of mature faith and, 493
Central conceptual structure, 353
Cerebral asymmetry, 629–630
Change:
developmental, 22–25
mechanisms of, dynamic systems, 304–305
transformational, 23, 25–28, 42
variational, 23, 25–28, 42
Chaos:
edge of, 482
theory, 197
Child-centered pattern, 499
Child movement, spiritual, 968–970
Child psychology, 166–169
blinders of adult psychological concerns, 167–169
versus developmental psychology, 166–167
Child study, historical perspective, 119
Choice points, 685–686
Chunking, 478
Clocks/rulers, 350–352
Coaction, 218–219
Co-constructivism, developmental biocultural, 585
Cognition:
emotion and, 320–336, 370–372
postformal, 492
Cognitive-cultural theories, religious/spiritual development, 970–971, 975–976
Cognitive development. *See also* Intellectual functioning across life span:
constructivist theory (Piaget), 303
dynamics systems perspectives, 283–284, 303, 341–342
multimodal processes in, 283–284
social framework and dynamic systems (Vygotsky), 303
stage debate and discovery of variability in, 341–342

Cognitive development and cultural psychology, 764–778
  hearts and minds, 768–772
    feelings, 768–769
    identities, 770–772
    values, 769–770
  methods, 778
  persons and contexts, 772–778
    cognitive development as expertise, 776
    conceptual development in core or privileged domains, 777–778
    contexts as linked practices, 773
    contexts as multiple and contested, 775
    contexts as shared meanings or practices,774–775
    contexts as warehouses for narratives or interpretations, 773–774
    nonprivileged domains, 776
  thought and action, 764–768
Cognitive neuroscience approaches, 602
Cognitive reemergence, modern era, 153–154
Cognitive-stage theories (Goldman), 958–959
Coherence, developmental, 528–529
Cohort effects, 611–612, 675–677
Collectivist culture and self-concept, 354
Columbine High School, 869, 870
Communication:
  communicative action, 24
  expressive-constitutive and instrumental-communicative functions of behavior, 22–25, 28
  language and communicative customs in cultural psychology, 740–749 (*see also* Language)
Communion/agency (polar dimensions of complexity), 485
Community:
  change, theory of context and, 913–914
  influence, theory of context and, 910–913
Community Change for Youth Development Initiative (CCYD), 927
Community hypothesis, positive youth development, 926–928
Compensation. *See* Selective optimization with compensation (SOC) model
Competence:
  versus dysfunction, 803–808
  versus performance, 278, 346
Complexity:
  dialectical thinking and optimal experience, 489–493
  foundations of, in child development, 493–506
  in later life, 482–493
  neoteny and, 506–509
  organized, 32
  parent-child interaction and growth of, 496–501
  polar dimensions of, 484–489
    agency and communion, 485
    divergent and convergent thinking, 486–487
    energy and quietude, 488–489
    extroversion and introversion, 488
    iconoclastic and traditional, 489
    passive investment and detached objectivity, 486
    playfulness and discipline, 487–488
  psychological; development and, 480–482
  social context, importance of, 494–496
  teacher-child interaction and growth of, 501–506
  wisdom and, 491–493
Connectionism (dynamic systems), 303
Connections among growers, 359–361
Constructive web, development as, 319–320, 325–329
Constructivist/constructivism:
  alternative, 346–347
  social and biological, 65
  theory of cognitive development, 303
Context, life course development and, 703–705
Contextual change hypothesis, positive youth development, 916–917
Contextual/ecological theorists, dynamic systems, 266–271
Control:
  action theory, 544–555
    action resources and perceived control, 548
    developing sense of control and personal agency, 547–548
    development of control-related beliefs/motivations, 546–548
    future selves, life plans, and cultural scripts, 550–551
    intentional action, developmental aspects of, 545–546
    intentional self-development, 548–551
    ontogeny of conceptual self and internalized control, 549–550
  dynamic systems, and levels of, 298
  personality development and beliefs about, 635–636
Control cycles, 691
Control-system theories of action, 522
Conventional interactionism, 43
Conventionalism, 71

Coping:
personality development and, 635–636, 641–642
PVEST (phenomenological variant of ecological systems theory), 848
religious/spiritual development as, 948–951, 984
Core conflictual relationship script, 377
Cortical connections, cycle of growth of, for each level of skill development, 389
Covariation hypothesis, positive youth development, 920–921
Creationist theory, 986
Creativity in later life, study of, 473, 484
Critical race theory (CRT), 830, 875–878
Cross-cultural psychology versus cultural psychology, 721–723
Cult/occultist practices, 987–988
Cultural practice theory, 200
Cultural psychology of development, 716–779
attachment, 740
attunement, 729
behavioral inheritance, 719, 720
classification of practices, 728–730
cognitive development and, 764–778
hearts and minds, 768–772
persons and contexts, 772–778
thought and action, 764–768
versus cross-cultural psychology, 721–723
custom complex, 725–728, 730
definitions, 719–721
disciplinary practices, 729
distributional practices, 729
early interpersonal experience, effects, 739–740
example, who sleeps by whom in the family, 725–727
facilitation, 728
gender practices, 729
induction, 729
local world of the child, 733–734
maintenance/loss, 729
maturation, 728
meaning of meaning and context, 724
mentalities, 730, 738–739
mental state concepts, special use of, 732–734
multiple, diverse psychologies, 723–724
versus other approaches to culture and psychology, 719–721
overview/introduction, 716–718, 778–779
processes, 728
self-development, 749–754
self practices, 729
selfways (ways of being), cultural diversity in, 754–764
social organization of childhood experience, 734–738
symbolic inheritance, 719
symbolic mediation of experience, 740–749
language as practice, 741–742
narrative, 744–749
socialization through language, 742–749
theory of mind, 731–732
two sides of, 730–731
unit of analysis problem, 724–730
Cultural standpoint, 38
Culture in human development:
academic achievement and, 504
action perspectives, 517, 518–519
age-related decrease in efficiency of, 577–578
age-related increase in need for, 576–577
developmental epistemology, 200–202
dialogical models of the self, 201
experiential perspectives, 468–469
generalization, 442–443
life span development:
co-evolution with biology, 575–578
intellectual development, 595–618
metatheories, split/relational, 66–68
personality development, 618–625
perspectives on person-environment system, 430–431
PVEST (phenomenological variant of ecological systems theory), and meaning/experience of, 854–859
variation in small-scale developmental sequences, 334
Cumulative continuity, 683
Cumulative disadvantages, 683
Custom complex, 725–728, 730

Data:
collected/derived, 172–173
methods for collection, person-environment perspective, 440–441
Death, conceptions of, 973–975
Decalage, Piagetian, 278, 343
Decomposition, principles of, 31
Defense mechanisms, 538
Deficits:
as catalysts for progress/growth, 579–580
perspectives, PVEST (phenomenological variant of ecological systems theory), 832, 835–836

Deictic pointers, 288
Demand characteristics of the person as developmental influences, 812–813
Depression, core conflictual relationship script for, 377
Detached objectivity/passive investment (polar dimensions of complexity), 486
Determinism, biological and social, 43
Deterministic thinking, PVEST (phenomenological variant of ecological systems theory) and, 831
Development:
  concept of, 22–33
    expressive-constitutive and instrumental-communicative functions of behavior, 22–25, 28
    nature of change, 23, 25–28
    unified, 28–30
    what changes, 22–25
  framing research agenda, 12–13
  mechanisms of, 45
  positive perspective, 11–12
  study of, 1–14
  taxonomy of theories, 304
  "when does it end":
    contemporary advances, 155
    historical theme, 122–123
Developmental epistemology, 166–202. *See also* Epistemological-ontological issues; Epistemology
  child psychology, blinders of, 167–169
    monocultural assumptions, 168
    reducing complexity to socially accepted norms, 168–169
  culture in human development, 200–202
  developmental systems analysis; rethinking Morgan's Canon, 179–185
    dynamic hierarchies in developmental processes, 182–183
    systemic causality in biological/psychological worlds, 180–182
    variability as phenomenon versus error, 183–185
  dynamic approaches in developmental psychology, 195–200
    development through "as-if" structures unfolding in time, 198–199
    development through disequilibriae (Peirce, Bergson, and Piaget), 196–197
    dynamic systems theory, 195–196 (*see also* Dynamic systems theory)
    post-Piagetian and post-Vygotskian models, 199–200
    progressing equilibration, 196
  foundations of developmental thinking, 177–179
  functional structuring, centrality of, 185–186
  general models for developmental science, 186–195
    coordination of the self and the other (Mead), 190–193
    developmental logic (genetic logic), Baldwin and, 187–188
    dialectical synthesis (Vygotsky), 191
    differentiation and equilibration: dynamics of structures, 187
    differentiation model (Werner), 189–190
    hierarchy of psychological functions (Janet), 188–189
    processes in the field of life space, 194–195
    theory of dynamic structural forms (Basov), 194
    topological psychology (Lewin), 194
  methodology and, 201–202
  multilevel nature of developmental processes, 178–179
  new discipline of developmental science in the making, 169–170
  overview/introduction, 166–167, 201–202
  science, basics of, 170–177
  special axiomatic features of development, 177–178
Developmental manifold concept, 217–218
Developmental principle, 92–94
Developmental psychobiological systems view, 210–249. *See also* Biology
  broader implications, 247–248
  developmental behavior genetics, 221–239 (*see also* Genetics)
  features, 221
  historical perspective, 140–142, 211–221
    birth of experimental embryology, 211–214
    coaction, 218–219
    developmental causality, 218–219
    developmental manifold concept, 217–218
    experience defined as functional activity, 220
    influences of sensory stimulation on genetic activity, 217
    systems versus mechanico-reductive and vitalistic-constructive viewpoints, 214–217
    triumph of epigenesis over preformation, 211
    triumph of probabilistic epigenesis over predetermined epigenesis, 219–220
  intersensory development, 239–247
    assumptions underlying traditional approaches, 241–243
    developmental psychobiological systems approach, 243–245

system characteristics of (structured organisms and structure environments), 245–247
traditional approaches to, 240–241
overview/introduction, 210, 221, 248–249
probabilistic epigenesis, 248
Developmental psychology, making of, 89–157
biological roots, 92
child study, 119
developmental principle, 92–94
developmental psychopathology, 114–117
developmental theory, 118–119
development and history, 90–92
education, 119–120
embryology and evolution, 92
emergence (1882–1912), 96–104
embryos and infants, 96–100
memory and intelligence, 100–104
evolution and development, 94–96
foundational period, themes of, 120–124
knowledge and consciousness, 120–121
morality and the perfectibility of humans, 123
nature and nurture, 122
ontogeny and phylogeny, 122
relations between thoughts and actions, 121–122
social applications, 123–124
when does development end, 122–123
interdisciplinary science, toward, 156–157
making developmental theory (Baldwin), 107–114
critical evaluation, 111–114
mental development and social ontogeny, 109–111
metaphysics and development, 108–109
sociogenesis, 110–111
middle period (1913–1946), 124–147
behaviorism and learning, 126, 129–132
comments, 146–147
developmental psychobiology and ethology, 140–142
emotional development, 126
ecological psychology, 145–146
field theory, 145–146
growth and physical maturation, 126, 132–135
institutions and development, 125–126
language and cognition development, 138–140
longitudinal study, 126, 128–129
mental testing, 125, 126–127
moral development, 136–138
psychoanalysis, 144–145
research methods, 126
social and personality development, 135–136
social neobehaviorism, 143–144
theoretical trends, 143–146
modern era, 147–157
attachment, discovery and loss, 151–153
cognitive reemergence, 153–154
social learning: rise, decline, and reinvention, 148–151
modern era: contemporary advances in historical themes, 154–156
knowledge and consciousness, 154
morality and perfectibility of humans, 155
nature and nurture, 155
ontogeny and phylogeny, 154–155
social applications, 155–156
thoughts and actions, 154
when does development end, 155
psychoanalysis/Freud, 114–117
trends, 117–120
United States, new psychology in, 104–107
Developmental systems:
analysis, rethinking Morgan's Canon, 179–185
defining features of theories, 3, 10–11
example of metatheory nested within relational metatheory, 39
Developmental theory, making, 107–114, 118–119
Developmental thinking, foundations of, 177–179
Developmental trajectory, 589, 685. *See also* Trajectory(ies)
Diachronic perspective, 405
Dialectical synthesis (Vygotsky), 191
Dialectical thinking and optimal experience, 489–493
Dialogical models of the self, 201
Differentiation and equilibration, dynamics of structures, 187
Differentiation model (Werner), 189–190
Disciplinary practices, 729
Discipline/playfulness (polar dimensions of complexity), 487–488
Discontinuity in development, 26
Disequilibriae, development through (Peirce, Bergson, and Piaget), 196–197
Dissociation, 379–382
Distal environments, 428
Distributional practices, 729
Diversity:
action-theoretical reconstructions, 527–535
from deficit to diversity in developmental science, 6–7

Diversity *(Continued)*
development of diverse groups (*see* Phenomenological variant of ecological systems theory (PVEST))
fundamental asset of human development, 11
intraindividual change, interindividual differences in intraindividual change, and fundamental substantive significance of, 3
universality/diversity hypothesis, positive youth development, 928
Domain specificity theory, 343–344
Down syndrome, 214, 500
Drawing Hands (Escher), 33–34, 36, 37
DSM III-R glossary of terms for defining mental disorders, and religious content, 986
Dualism, 57, 58
Duration, concept of, 682
Dynamic development of action and thought, 313–390
building structures; transition mechanisms, microdevelopment, and new knowledge, 363–370
bridging, process of building new knowledge, 368–370
construction processes, from micro to macro, 364–370
growth curves, chaotic/scalloping/stable, 367
growth curves, novice/intermediate/expert, 367
multiple dimensions of learning and development, 367–368
relations between micro- and macrodevelopment, 363–364
shapes of growth curves in construction and generalization of new skills, 365–367
shift of focus in transitional states, 365
cognitive and emotional development, dynamic structure in, 320–336 (*see also* Cognitive development)
crisis of variability and the Cartesian synthesis in developmental science, 336–347
Cartesian dualist framework, 337–338
competence/performance models, 346
constructivist alternative, 346–347
domain specificity theory, 343–344
explaining variability versus "explaining away," 342–346
modern synthesis in psychology; nativism and empiricism together, 338–340
neo-nativist movement, 344–346
reasserting stage theory, 343
stage debate and the discovery of variability in cognitive development, 341–342
structure-as-form paradigm, 340–341
dynamic structuralism, 314–320
dynamic nature of psychological structure, 317–318
dynamic structure in living systems, 318–319
form, defined, 315
structure, defined, 315
structure/form problem, 315
variability in "the middle of things"; exampleof representing social interactions, 315–317
variation and order in development; the constructive web, 319–320
emotions and dynamic organization of activity and development, 370–382
attachment, working models, and temperament, 376–378
culture and emotion, 374–375
developmental shifts in emotions about self in family roles, 378–379
development of emotional splitting and dissociation, 379–382
dynamic shifts of positive/negative biases in webs, 378
emotionally organized development, 376–382
emotion and cognition together, 370–372
families of emotions, dimensions, and cultural variations, 373–376
hierarchy of emotion categories (diagram), 374
one-way effects on developmental webs for shame and honor, 376
organizing effects of emotions, 372–376
scripts, 372–373
methodology, dynamic structural analysis, 347–363
building and testing models of growth and development, 356–363
clocks, rulers, and repeated measures, 350–352
equilibration, disturbance, and the shapes of development, 361–363
guidelines for developmental research, 349–356
logistic growth, 357–359
nonlinear dynamic models of growth and development, 357
single context assumption—not, 349
single-level, single-competence assumption—not, 349
single-person assumption—not, 349

single-shape assumption—not, 349
starting in the middle of things; implications for design, 348–349
nature/nurture; growth cycles of psychological and brain activity, 382–388
overview/introduction, 313–314
stability and variability in development, 388–390
Dynamic force fields (Lewin), 268
Dynamic hierarchies in developmental processes, 182–183
Dynamic order in hierarchical complexity, 179
Dynamic skill theory, 332–336
Dynamic structural forms, theory of (Basov), 194
Dynamic systems theory, 195–196, 258–307
adaptation of Waddington's epigenetic landscape, 276
attractors and dynamic stability, 272–274
bimanual coordination, 297–298
cognitive development, multimodal processes in, 283–284
contextual and ecological theorists, 266–271
development as selection, 284–286
development from perspective of, 276–297
dynamic epigenetic landscape, 276–277
dynamic force fields (Lewin), 268
embodiment, 287–289
embryology, lessons from (form from a formless egg), 260–263
epigenesis in developmental psychobiology, 263–266
epigenetic landscape, 261, 281
experience-dependent plasticity, 282–283
exploration, 286–287
fluctuations/transitions, 275–276
general systems theories, 267–271
intellectual heritage; developmental process, 259
layered levels of analysis, 279–281
model of levels of control, 298
mountain stream metaphor, 263
multicausality, 281–282
nested timescales, 277–289
order from complexity, 271–272
and other theories of development, 303–304
biological constraints, 305
brain development as source of constraints, 305–306
connectionism, 303
constructivist theory of cognitive development (Piaget), 303
dynamics as source of structure and change, 306
mathematical formalisms and simulations, 306–307
mechanisms of change, 304–305
mental representations, 306
nativist theory of language development (Chomsky), 303
sensorimotor bases of higher cognition, 306
social interaction, 305
structuring role of external information, 305
taxonomy of developmental theories, 304
theory of cognitive development in social framework (Vygotsky), 303
theory of perception and perceptual development (Gibson), 303
overview/introduction, 258–259, 307
pendulum as dynamic system, 272, 273
phase-space diagram of development (Waddington), 261
rationale, 307
reach, learning to, 292–297, 298
research, approach to, 289–292
characterizing the behavioral attractor states, 289
describing dynamic trajectory of collective variable, 289–290
identifying collective variable of interest, 289
identifying points of transition, 290
identifying potential control parameters, 290–292
manipulating putative control parameters to experimentally generate transitions, 291–292
skill, defining, 298–307
soft assemblies, 274–275
synergetics, 271
systems theory as metaphor, 268–271
Dysfunction versus competence, 803–808

Ecological perspectives:
behavioral ecology, 44
biology and (*see* Bioecological model of human development)
history of ecological psychology, 145–146
phenomenological variant (*see* Phenomenological variant of ecological systems theory (PVEST))
Edge of chaos, 482
Education:
academic/school success, 881–883, 917
educational pathways, 681
historical perspective, development and, 119–120
Montessori and traditional school environments, compared, 503–506

Education *(Continued)*
religious schools, 980–981
teacher-child interaction and growth of complexity, 501–506
EEG graphs, 387, 388
Elderly. *See* Older adults
Embodiment, 47–54, 287–289
biological, 48–49
defined, 47–49
developmental oriented embodied action metatheory, 47–54
dynamic systems, 287–289
person, biology, culture, 48
person-centered, 49–54
sociocultural, 49
Embryogenesis, 19
Embryology, 96–100, 211–214, 260–263
Emergence zones, 363
Emotion:
attachment, working models, and temperament, 376–378
culture and, 374–375
developmental shifts in, about self in family roles, 378–379
development of emotional splitting and dissociation, 379–382
dynamic organization of activity and development, 370–382
dynamic shifts of positive/negative biases in webs, 378
emotionally organized development, 376–382
emotion and cognition together, 370–372
families of; dimensions, and cultural variations, 373–376
hierarchy of emotion categories (diagram), 374
mediating mental system, 412
one-way effects on developmental webs for shame and honor, 376
organizing effects of, 372–376
person-environment and, 412
process (diagram), 371
scripts, 372–373
in self-evaluation, 540
Emotional development:
Lewis's three scales of, 280
positive youth development, 909
Emotional discomfort, 839
Emotional splitting, 379–382
Emotional tone and reactivity, personality development and, 630–631
Empiricism/materialism/objectivism, 57–58
Empowerment, positive youth development and, 907
Enabling, affective/cognitive (supportive/challenging), 497
Encoding as mechanism of development, 45
Endpoints, developmental, 26
Energy/quietude (polar dimensions of complexity), 488–489
Engagement, youth, 918
Environment(s), 420–431
actual/perceived, 422
as changing stage for individual functioning and development, 428–429
concept of context, 421
conceptual and empirical analyses of, 422
cross-cultural perspective, 430–431
in developmental research, 421–422
distal, 428
formal and informal societal regulations, 428
social and economic conditions, 428
family as, 425–426
formative and eliciting events, 424
optimal, 423–424
peers, 426–428
physical, 422
proximal dynamic person-environment systems, 425
significant events, 424–425
social-cultural, 422
as source of information and stimulation, 422–423
synchronization, 429–430
Environmental dynamics, bioecological model:
infancy, 809–810
old age, 808–809
Environmentalistic model, 435
Epigenesis, 211, 219–220, 248, 263–266
Epigenetic landscape, 261, 276–277, 281
Epigenetic robotics, 288
Epiphenomenalism, 750
Epistemological-ontological issues, 54–70
culture and development in split and relational metatheories, 66–68
empiricism/materialism/objectivism, 57–58
Marxist split tradition, 65–66
methodology, 70–80
modernity and elaboration of relational metatheory, 58–65
Hegel, 59–60, 61–63
hermeneutics, 63–65
Kant, 60–61
Leibniz, 58–59

phenomena-noumena split, 61
phenomenological constructivism and realism, 63
relational developmental reconciliation of mind and nature, 61–63
modernity and rise of the split tradition, 56–58
Plato and Aristotle and relational developmental tradition, 55–56
pragmatism, 68–70
split mechanical explanation, 70–75
Epistemology:
defined, 54
developmental (*see* Developmental epistemology)
principles (terminology), 21
Equifinality principle, 182, 185, 213
Equilibration, 196, 361–363, 474
Equilibrium, 21, 198, 475–477
Ethology, 140–142
Events:
formative and eliciting, 424
significant, 424–425
Evolution, development and:
history, 94–96
relational history and relational models, 39–41
split approaches, 41–47
Evolutionary perspective:
analogy with, 168–169
intellectual functioning, mechanics/pragmatics, 604
selection benefits decreasing with age, 575–576
versus synchronic/diachronic, 405
Executive function of personality, 621
Exosystem, 818
Experience(s):
bioecological model, 796–797
dynamic systems and, 282–283
as functional activity, 220
heterogeneity of, 188
plasticity and, 282–283
Experience Sampling Method (ESM), 468, 503
Experiential perspective on development, 465–510
child development, foundation of complexity in, 493–506
complexity in later life, examples, 482–493
dialectical thinking and optimal experience, 489–493
dimensions, 484–489
wisdom, 491–493
developing person in context, 468–469
historical context, 466–468
ideal outcomes of adult development, 472–474
neoteny, 506–509
optimal arousal, human nature and, 469–471
optimal experience theory, 474–482
flow and development, 479–480
Montessori educational model and, 504–505
optimal experience of flow, 477–479
other perspectives on self-environment equilibrium, 476–477
phenomenological extension of Piaget, 474–475
psychological complexity and development, 480–482
overview/introduction, 465–466, 509–510
parenting, 495–501
in adolescence, 496–498
in childhood, 498–499
in infancy, 499–501
play, syntelic character of play, 507–509
self-regulation of experience, potential, 471–472
social context, importance of, 494–496
teacher-child interaction and growth of complexity, 501–506
Experiments, role in bioecological model, 808–810
Exploration, 286–287
Expressive-constitutive and instrumental-communicative functions of behavior, 22–25, 28
Extroversion/introversion (polar dimensions of complexity), 488

Facilitation (cultural psychology), 728
Faith developmental theory (Fowler), 959–961
Family(ies):
in context, 426
as environment in the socialization process, 425–426
reciprocity in relations and levels of analysis, 425–426
religious/spiritual development, 977–980
time dimension and, 426
"Feeling into" others (EinFühlung) intersubjectivity, 199
Feelings, 768–769
Field theory, 145–146
Flow, 467–471, 477–480, 505
absence of, 470
development and, 479–480
experiences, 467–468
Montessori and, 505
optimal arousal of, 469–471
optimal experience of, 477–479
organizing construct, 471
Force characteristics as shapers of development, 810–811

Form, 185, 315, 340–341
Fossilization of behavior, 195
Foundationalism, 31, 55, 56
Frames of reference:
  individual-ecological, 174
  individual-socioecological, 174–175
  inter-individual, 173–174
  intra-individual, 173
  organizing knowledge construction, 173–175
Freeman v. Pitts, 872
Fully functioning person (Rogers), 476
Functional interaction, 434–436
  causality in, 435–436
  nonlinearity, 435
  reciprocity and interdependence, 434–435
Functional pleasure, 475
Functional structuring, centrality of, 185–186

Gain-loss dynamic, development as, 582–584
Gender:
  cultural psychology, 729
  life course and principle of timing, 694
  positive youth development, 928
Generalization, 325, 365–367, 441–443, 446–447
General systems theories, 267–271
Generations, life course development/life cycle and, 669, 673
Genetics, 221–239
  bean bag concept of genome, 42
  development and, 221–239
    animal models, 223–224
    approaches to genetic analysis of development, 221–225
    individual development, 221
    population approach, 221–222
    single gene and multiple factor research on individual differences, 224–225
    sources of individual differences, 225
  ecological systems theory, genotype in, 867
  gene-environment interactions in the life course, 702–705
  gene expression arrays, 237–238
  gene tally, 236–237
  heredity, 225–228
    at conception, 225–226
    dissecting heredity, 228
    non-Mendelian, 227–228
    operational definition of, 227
    studying difference in, 226–227
  heredity/environment, separating effects of, 228–236
    documenting norm of reaction, 231–232
    hardware-software distinction, 235–236
    heritability and additivity, 229–231
    in humans, 232–233
    scope of gene-environment interactions, 233–235
  heritability, changes in across life span, 614–615
  implications of new molecular biology, 236–239
  molecular markers, 238–239
  targeted mutations, 238
Germany, West/East, 691
Goals:
  action theory, 540–544, 553–555
  adjusting, 553–555
  chronic, 543–544
  developmental, 540–544
  personal life investment (PLI) and, 636
  selection of, and life priorities, 638–639
  semantic and procedural specification, 542–543
God. *See* Religious and spiritual development
Goodness of fit, 481
Great Depression, 678, 690, 692, 693, 696, 698
Growth curves, 356–363
Growth/physical maturation, historical themes, 126, 132–135
Guided participation as universal process, 498–499

Hardware-software distinction, 235–236
Harmonious-equipotential systems, 213
Health and well-being, religious/spiritual development and, 982–983
Heredity. *See* Genetics
Hermeneutics, 63–65
Heterarchy, 195
Hierarchy of psychological functions (Janet), 188–189
Historical cohorts, 586–587
Historical time and place, principle of, 697–700
Holism, 32–33
Holistic-interactionistic model, 431–439. *See also* Person-environment relations, holistic-interactionistic approach
Hypotheses testing, theory-driven versus pseudo-empirical, 173

ICE. *See* Identity-focused cultural ecological (ICE) perspective
Iconoclastic/traditional (polar dimensions of complexity), 489
Ideal outcomes of adult development, 472–474

Identity(ies):
cultural psychology, and cognitive development, 770–772
positive, and positive youth development, 908
preserving; assimilative and accommodative processes, 551–555
research emphasizing (phenomenological variant of ecological systems theory), 842, 843
Identity-focused cultural ecological (ICE) perspective, 829, 846–847, 852
Identity moment of analysis, 33–34
Identity of opposites, 33–36
Idiosyncratic influences, nonnormative, 586–587
Immediate feedback cycle, 191
Immigrants, special experiences of, 859–864
Induction, 72–73, 729
Infancy:
complexity and parenting in, 499–501
effective of mother's responsiveness, 800, 801
environmental dynamics in, 809–810
mother-infant dyad as context of development, 815–817
object permanence, 345
personality development, and links to old age, 621–622
predicting childhood intelligence on basis of behavior in, 612
Inference-making perceptions, 844–847
Inhibition and interference, 601
In medias res, 198, 315–317, 318, 348–349, 371
Institutions and development, 125–126
Instrumentalism, 71
Instrumentalism-conventionalism, 74–75
Intellectual development, and positive youth development, 909
Intellectual functioning across life span, 595–619. *See also* Cognition; Cognitive development:
biology and culture of, 596–600
cognitive intervention work: activation of learning potential among older adults, 612
cohort effects, period effects, and environmental change, 611–612
crystallized pragmatics of cognition, 599, 604–609
evolutionary perspective, mechanics and pragmatics in, 604
fluid mechanics of cognition, 600–604
age-based differences; testing the limits, 603–604
cognitive neuroscience approaches, 602–603
inhibition and interference, 601–602
processing speed, 601
search for determinants of mechanic development, 600–601
working memory, 601
heritability across life span, changes in, 614–615
intellectual growth during adulthood, stage conceptions versus functionalist approaches, 606–607
malleability/plasticity, 611–612
normative versus person-specific pragmatic knowledge, 605–606
old age, mechanics/pragmatics in, 615–617
overview/introduction, conclusions, 617–619
prototypical examples:
adult age differences in upper limits of short-term memory (serial word recall), 603–604
speed and knowledge in aging typists, 610–611
stability in, 612–613
predicting childhood intelligence on basis of infant behavior, 613
relative interindividual stability after infancy, 613–614
two-component model (mechanics versus pragmatics), 596–600
cognitive mechanics, 596–597
cognitive pragmatics, 597
divergence in life span trajectories between mechanics and pragmatics, 597–598, 600
relations to other theories, 600
varieties of mechanic/pragmatic interdependence, 609–611
age of peak performance in complex skills, 609–610
mechanic-pragmatic interdependence, evidence at cortical level, 609
wisdom as expertise, 676–609
Intellectual heritage, developmental process (dynamic systems), 259
Intelligence and memory, 100–104
Intentional action, developmental aspects of, 545–546
Intentionality, 903–904
Intentional self-development, 535–544, 548–551
activities of, 535–536
attentional focus, 537–538
complexity and differentiation, 537
and the developing self, 548–551
goals, 540–544
protective and defensive mechanisms, 538
self-evaluation processes, 538–540

Intentional self-development *(Continued)*
self-observation and self-monitoring, 536–538
structure and process, 535–536
Interactionism, 57
bio/social, 43
conventional, 43
Interest convergence, 876
Interindividual differences, in developmental trajectories, 589
Internal feed-forward cycle, 191
International nature of contemporary psychology, 171
Interpersonal experience, effects of early, 739–740
Intersensory development, 239–247
developmental psychobiological systems approach, 243–245
system characteristics (structured organisms and structure environments), 245–247
traditional approaches, 240–243
Intransitive hierarchies in real life, 183
Introversion/extroversion (polar dimensions of complexity), 488

Jung (religious/spiritual development), 949

Kant, 60–61
Kellogg Youth Initiative Partnerships (KYIP), 927
"Knowing" (dynamic systems), 303
Knowledge and consciousness:
contemporary advances, 154
historical theme, 120–121

Language:
acquisition of, person-environment perspective, 412
and cognition development (history), 138–140
culture and, 740–749
narrative, 744–749
as practice, 741–742
socialization through, 742–749
Learning:
commitment to, and positive youth development, 907
growth from novice to expert, 367
multiple dimensions of, 367–368
Leibniz, 58–59
Levels of discourse in understanding a domain of inquiry, 20
Levels of organization, developmental systemstheories, 3
Life-course persistent antisocial behavior, 685

Life-course theory, 665–707
age, 672–679
cohorts, 675–677
temporality and, 669
basic concepts and perspectives, 679–689
selection, endogeniety, and contextual effects, 687–689
social pathways, cumulative processes, and the individual life course, 680–684
trajectories, transitions, and turning points, 684–687
biological models, integrating, 701–706
future directions, 705–706
gene-environment interactions, 702–705
concepts of human development across the life span, 670–672
contributions to study of human development, 700–701
cycles, 672–673
generations, 669, 673
historical account, 668–679
life cycle, 669, 677–679
life transitions and historical change, 689–701
linking mechanisms, 689–691
overview/introduction, 665–668, 706–707
paradigmatic principles, 691–700
historical time and place, 697–700
human agency, 692–694
life-span development, 669, 692 (*see also* Life span development)
linked lives, 695–697
timing, 694–695
relationship view of life patterns, 673
research traditions and concepts, 669
roles, 672–673
social organization of lives, 672–673
sociocultural patterns in human experience, 674–675
Life space, 194–195
Life span development, 569–644
concluding comments, 643–644
historical background, 571–574
level 1 (overall architecture; first view from perspectives of biological and cultural co-evolution), 574, 575–578
age-related decrease in efficiency of culture, 577–578
age-related increase in need for culture, 576–577
evolutionary selection benefits decreasing with age, 575–576

level 2 (life span changes in relative allocation of resources to distinct functions of development), 574, 578–580
deficits as catalysts for progress, 579–580
growth versus resilience (maintenance) versus regulation of loss, 578–579
level 3 (metatheoretical propositions about life span developmental theory), 574, 580–591
cross-sectional to longitudinal to sequential, 587–589
development as gain-loss dynamic, 582–584
development as selection and selective adaptation (optimalization), 580–582
experimental simulation of development, 589–590
family of theoretical propositions characteristic of life span developmental psychology, 581
focus on plasticity and age-associated changes in plasticity, 584–586
macro-model of developmental influences, 586–587
methodological developments, 587–591
ontogenetic and historical contextualism as paradigm, 586
reformulating concept of development from functionalist perspective, 580–584
selective age-related change in adaptive capacity, 580–582
testing-the-limits paradigm, 590–595
level 4 (systemic and overall theory; selective optimization with compensation), 574, 591–595
age gradients, 594–595
compensation, 593–593
definitional frames, 592
definition of selection, optimization, and compensation, 591–593
dual-task research and behavioral indicators, 594–595
empirical evidence, 594
examples from proverbs and questionnaire items, 592
management and mastery of life tasks, 595
optimization, 593
selection, elective and loss-based, 593
level 5 examples, 575–617
overview/introduction, 569–571, 574
toward psychological theories of; five levels of analysis, 574–575
Lines of sight, 36
Linked lives, principle of, 695–697, 822
Living systems, dynamic structure in, 318–319
Logic, developmental/genetic (Baldwin), 187–188
Logistic growth, 357–359
Logos/mythos, 492
Longitudinal hypothesis, positive youth development, 923–925
Longitudinal study, historical perspective, 126, 128–129
Loss, regulation of, 578–579
Love:
and discipline, parenting behaviors, 495
prototypical script for adult, 373
Love of fate, 476–477

Macro-model of developmental influences, 586–587
Maintenance/loss, 578–579, 729
Malleability, in intellectual functioning, 611–612
Mammalian coat coloration, 262
Manifold concept, developmental, 217–218
Marginalized youth, frequently, 833
Marxist split tradition, 65–66
Mastery, life-events and, 688
Materialism:
dialectical, 31
empiricism/objectivism and, 57–58
Materialist ontology, 55
Mathematical formalisms and simulations, dynamic systems, 306–307
Maturation:
concept of, 27
cultural psychology and, 728
religious/spiritual development as, 947–948
Meaning of meaning and context, 724
Measurement models, 443–447
individuality and generalization, 446–447
measurement model 1 (MM1), 443–445
measurement model 2 (MM1), 445–446
pattern analysis of environments, 447
pattern analysis of individuals, 446
Mechanico-reductive and vitalistic-constructive viewpoints; systems versus, 214–217
Mechanics. *See* Intellectual functioning across life span; Personality development across the life span
Mediating mental system, 409–414
comments, 414
development of, 413
emotions, 412
language and language acquisition, 412
motivation, 412–413

Mediating mental system *(Continued)*
self-consciousness, self-perceptions, and self-evaluations, 411–412
subconscious processes, 410
values, valuations, and norms, 410–411
Memes, 472
Memory and intelligence, 100–104
Mental development and social ontogeny, 109–111
Mental disorders, religious/spiritual development and, 989
Mentalistic model, 435
Mentalities, cultural, 730, 738–739
Mental representations, dynamic systems, 306
Mental state concepts, special use of, cultural psychology, 732–734
Mental testing, 125, 126–127
Mesosystem, 820
Metamethod, 21
Metaphysics, 54, 108–109
Metatheories, 20–21
levels of discourse in understanding a domain of inquiry, 20
relational, 3, 5–6, 19, 32–39
holism, 32–33
identity of opposites, 33–36
implications for developmental science, 5–6
opposites of identity, 36–37
synthesis of wholes, 37–39
split, 19, 30–32
Method of double stimulation (MeDoSt), 191–192
Methodology:
building/testing models of growth and development, 356–363
connections among growers, 359–361
equilibration, disturbance, and the shapes of development, 361–363
logistic growth, 357–359
nonlinear dynamic models of growth and development, 357
consistencies, two kinds, 176
cross-sectional to longitudinal to sequential, 588–589
cycle, 175–177, 201
as epistemic cycle, 175–177
experimental simulation of development, 589–590
guidelines for developmental research, 349–356
metamethods, 20
objectivity through subjectivity, 176–177
relational scientific, 74–80
abduction-transcendental argument, 77–80
causality and action patterns, 76–77
interpretation and observation, 75–76
split mechanical explanation, 70–75
causal explanation (step 2), 72
induction of interpretation free hypotheses, theories, laws (step 3), 72–73
instrumentalism-conventionalism, 74–75
positivism and neopositivism, 73–74
reduction description (step 1), 71–72
terminology, 20
testing the limits, 590
Microdevelopment:
construction processes: from micro to macro, 364–370
relations between micro- and macrodevelopment, 363–364
Microgenesis, 19
Microgenetic investigations, 190
Microsystem:
beyond, 817–820
defined, 866
magnified, 814–817
Middle of things (in medias res), 198, 315–317, 318, 348–349, 371
Military service, transition to, 698–700
Mind:
and nature (Hegel's relational developmental reconciliation of), 61–63
as specialized living system, 318
theory of, 731–732
worldviews and self-perceptions, 452
Minnesota Multiphasic Personality Inventory (MMPI), 986
Missouri v. Jenkins, 872
Model/paradigm (terminology), 21
Models of growth/development, building/testing, 356–363
connections among growers, 359–361
equilibration, disturbance, and the shapes of development, 361–363
logistic growth, 357–359
nonlinear dynamic models of growth and development, 357
Modern era, 147–157
attachment, discovery and loss, 151–153
cognitive reemergence, 153–154

contemporary advances in historical themes, 154–156
knowledge and consciousness, 154
morality and perfectibility of humans, 155
nature and nurture, 155
ontogeny and phylogeny, 154–155
social applications, 155–156
thoughts and actions, 154
when does development end, 155
social learning: rise, decline, and reinvention, 148–151
Modernity:
and elaboration of relational metatheory, 58–65
and rise of the split tradition, 56–58
Molecular markers, 238–239
Moments of analysis, 33–34
Monad, 58
Monism, 58
Montessori and traditional school environments, compared, 503–506
Moral development:
historical perspective, 136–138
religious/spiritual development, 983–984
Morality and perfectibility of humans:
contemporary advances, 155
historical theme, 123
Morgan's Canon, 179–185
Motivation, person-environment and, 412–413
Motivational theories of action, 522
Mountain stream metaphor, 263
Moving to Opportunity (MTO), 688–689
Multicausality, dynamic systems, 281–282
Multidisciplinarity and need for change-sensitive methodologies, 3
Multiple context model, 817
Mutual interweaving, 200
Mythos/logos, 492

Narrative:
children's, variability in, 316–317
cultural psychology:
dynamics of practice, 748–749
getting stories straight, 744–749
storytelling beginning early, 745–747
variability and heterogeneity, 747–748
varieties of oral, 745
Nativism:
modern synthesis, empiricism and, 338–340
neo-nativist movement, 344–346
theory of language development (Chomsky), 303
Natural selection, 42
Nature and nurture:
bioecological interpretation, 819–820
biological determinism, 43
bio/social interactionism, 43
contemporary advances, 155
contrast, 167
conventional interactionism, 43
hereditary and environmental factors in individual development, 416–418
historical theme, 122
joining; growth cycles of psychological and brain activity, 382–388
clusters of discontinuities, 383
concurrence of independent growers, 384
cycles of discontinuities forming levels and tiers, 385
cycles of reorganization in development, 385–388
domain specificity of activities and localization of brain functions, 384
emergence of neural networks and action control systems, 385
epigenesis of action, feeling, thought, and brain, 382–383
growth cycles in brain, 387–388
hierarchical growth of action and thought, 386–387
principles for understanding growth patterns of brain and behavior, 383–385
social determinism, 43
strategies, 43
Neighborhoods:
assessments, phenomenological variant of ecological systems theory, 870
social integration, 818
well-being and, 689
Neo-Darwinian:
metatheory and mechanisms of development (variational change) diagram, 44
synthesis, 41
Neo-nativist movement, 344–346
Neoteny, 506–509
Neuroscience/brain, 305–306, 382–389, 602, 628–630. *See also* Biology
New York City Beacons project, 927
Nice-mean social interactions:
developmental web, 326
developmental web biased toward nice interactions, 328
stories, 330

Nondeterministic theorizing, 841
Nonlinearity:
  dynamic models of growth and development, 357
  holistic-interactionist model, 435
Normative versus person-specific pragmatic knowledge, 605–606
Novelty, 181–182, 433–434
Novice/intermediate/expert skill use, growth curves, 367

Objectivism, 57–58
Objectivity through subjectivity, 176–177
Object permanence in infants, 345
Object relations theorists, religious/spiritual development and, 950–951
Older adults:
  cognitive intervention work; activation of learning potential among, 612
  complexity in later life, examples, 482–493, 615–617
  covariance dedifferentiation, 615–616
  directionality dedifferentiation, 615
  environmental dynamics, 808–809
  maintenance of divergence in explanatory corrrelational patterns, 616–617
  mechanics and pragmatics in very old age, 615–617
  religious/spiritual development and, 985
  speed and knowledge in aging typists, 610–611
Ontogenesis, 19, 24
Ontogenetic and historical contextualism as paradigm, 586
Ontogeny and phylogeny:
  contemporary advances, 154–155
  historical theme, 122
Ontology:
  defined, 54
  ontological principles, 21
  and the Real, 54–55
Open systems, 271–272
Opposites of identity, 36–37
Optimal arousal, human nature and, 469–471
Optimal environments, 423–424
Optimal experience theory, 474–482
  flow and development, 479–480
  Montessori educational model and, 504–505
  optimal experience of flow, 477–479
  other perspectives on self-environment equilibrium, 476–477
  phenomenological extension of Piaget, 474–475
  psychological complexity and development, 480–482
Optimal/functional levels, 386
Optimism, 3
Optimization. *See* Selective optimization with compensation (SOC) model
Optimization processes, 904
Order from complexity, 271–272
Order parameters, 271
Organization, holistic-interactionist model, 437–439
Orthogenetic principle, 60, 189–190
Overaccommodation, 478
Overassimilative mode, 478

Paratelic, 479
Parenthood, transitions to during adolescence, 685–686
Parenting:
  bioecological model, mother-infant dyad, 800, 801, 815–817
  complexity and (experiential perspective), 496–501
    adolescents, 496–498
    children, 498–499
    infants, 499–501
  cultural psychology; models/strategies, 738–739
    customary scripts for interaction, 739
    moral direction, 738–739
    pragmatic design, 739
"Parent persons," 499
Parsimony, principle of, 179–185
Pars pro toto error, 168
Partially ordering scaling, 334
Passive investment and detached objectivity (polar dimensions of complexity), 486
Pathology:
  developmental psychopathology, historical perspective, 114–117
  religious/spiritual development and, 985–990
    cult and occultist practices, 987–988
    mental disorders, 989
    terrorist groups (religious/spiritual development), 988–989
    toxic beliefs/practices/attitudes, 989–990
Pattern analysis:
  of environments and person-environment systems, 447
  of individuals, 446
Pattern formation, 285
Peers/peer groups, 426–428
Pendulum as dynamic system, 272, 273
Perception and perceptual development, theory of (Gibson), 303

Perfecting, religious/spiritual development as, 951–952
Person-agent, 50–51, 53–54, 409
Personal attributes model, 866–867
Personal control. *See* Control
Personality consistency, person-environment interaction, 418–419
Personality development across the life span, 619–643
  allocation of resources, 625
  approach/avoidance goals, 630–631
  approaches to study of, 619–620
  behavioral indicators, development of, 630–632
  biology and culture, illustrations of role of, 623–625
  cerebral asymmetry, 629–630
  continuity and change, life-long transactional adaptation, 626–637
    development of neurophysiological indicators of life mechanics of personality, 628–630
    dynamic interaction of mechanics/pragmatics, 627–628
    evidence on development of life pragmatics of personality, 632–637
    mechanics and pragmatics of life as relevant to personality functioning, 626–627
    mechanics of life as relevant to personality functioning, 626–627
    pragmatics of life as relevant to personality functioning, 627
    summary, 637
  control and self efficacy beliefs, 635
  coping, 635–636, 641
  emotional tone and reactivity, 630–631
  foci/facets, summarizing, 642–643
  goal system and personal life investment, 636
  key features of life span approach, 620–623
    executive function of personality, 622
    providing links from infancy to old age, 622–623
    search for general-purpose mechanisms, 621–622
  links from infancy to old age, 622–623
  neurophysiological indicators of life mechanics of personality, 628–630
  protecting/optimizing characteristics, 643
  reserve capacities of self and personality development, 637–641
  self-concept development, 634
  self-regulatory processes, 620, 635–637
  self-system approach, 619–620
  trait approach, 618, 632–633
Personal life investment (PLI), 636
Personal regulation of developmental processes (action theory), 519–520
Personal/social assets facilitating positive youth development, 909
Person-centered embodiment, action, and development, 49–54
Person characteristics, and later development (bioecological model), 810–813
  demand characteristics, 812–813
  developmentally generative dispositions in life-course perspective, 810–812
  force characteristics, 810–811
  resource characteristics, 812
Person-context model, 866
Person-environment relations, holistic-interactionistic approach, 400–452
  classical interactionism, 406
  cultural and cross-cultural research, 449
  environment, 402–403, 420–431
    distal, 403
    proximal, 403
  general approaches to, 405–409
  goal of scientific psychology, 403–404
  holistic-interactionistic model, 404–405, 431–439
    biological model, 435
    causal models, metatheoretical level, 435
    environmentalistic model, 435
    functional interaction, 434–436
    mentalistic model, 435
    nonlinearity, 435
    organization, 437–439
    reciprocity and interdependence, 434–435
    synthesis; integration of processes, 439
    temporality, 436–437
    transformation, emergence, and novelty in structures and processes, 433–434
    variables/individuals, 431–433
  longitudinal design, 448–449
  measurement models, 443–447
  methodological implications, 439–447
    generalization, 441–443
    mechanisms, 440
    nature of phenomena, levels of analysis, 440
    statistics, 447–448
    tools in acquisition of information, 440–441
    toward a developmental science, 439–440
  multidisciplinary collaboration, 449
  multivariate approach, 448
  overview/introduction, 400–402, 450–452

Person-environment relations, holistic-interactionistic approach *(Continued)*
perspectives, synchronic/diachronic/evolutionary, 405
prevention, treatment, intervention, 449–450
propositions, 401, 407
research strategy, 448–450
unidirectional models, 405–406
worldviews and self-perceptions, mind and, 452
Person as organizing principle for scientific inquiry, 409–420
active agency, 409
behavior in holistic-interactionistic model, 414
biological age, a marker of maturation rate, 417–418
biological factors in interaction processes, 414–416
antisocial behavior, 415
well-being, 415–416
individuality, the developing person, 419–420
mediating mental system, 409–414
development of, 413
emotions, 412
language and language acquisition, 412
motivation, 412–413
self-consciousness, self-perceptions, and self-evaluations, 411–412
subconscious processes, 410
values, valuations, and norms, 410–411
nature-nurture issue, 416–418
personality consistency, 418–419
Person standpoint, 37, 38, 49–50
Phase-space diagram of development (Waddington), 261
Phenomena-noumena split, 61
Phenomenological constructivism and realism, 63
Phenomenological extension of Piaget, 474–475
Phenomenological variant of ecological systems theory (PVEST), 829–888, 905
conceptual advantages of, 872–874, 886–888
critical race theory, 875–878
cross-cutting human development themes, 853–864
cultural context of African American males, 856–857
demonstration, application (diagram), parent/adolescent academic/employment outcomes, 851
as dual axis coping outcome interpretational framework, 886–888
ecological perspectives; exploring the bioecological model, 864–868
example of African Americans and achievement gap (interface of stigmatizing context, reactive coping, responses, and the "acting white" myth), 878–883
Black response to freedom; social movement for education, 880–883
developmental considerations for research on Black academic achievement, 881–883
historical overview of African American achievement motivation, 879–880
immigrants, special experiences of, 859–864
importance of broad cultural inclusiveness and context, 854–864
interpretations of youths' stage-specific coping outcomes as function of net vulnerability, 885–886
intervention design, 853–864
meaning/experience of culture, 854–856
overview/introduction, 829–833, 848, 885–886
positive youth development and, 905
predicting positive outcomes in face of challenge, 887–888
racism and human development, 883–885
rationale; need for new theory, 830–832
social science assumptions/practices, judicial decisions, (twentieth century), 868–878
cross-disciplinary contributions from legal studies, 874–878
inferences, assumptions, and what *Brown v. Board of Education* should have considered, 868–872
shortcomings of social science contributions to the *Brown* decision, 871–872
traditional assumptions, beliefs, and values, 872–874
study of diverse youth; children of color and privilege, 833–844
deficit perspectives and stigma, 835–836
domains of human development and competence, 838–839
flaw of context ignored, 833–836
flaw of general lack of a developmental perspective when considering youth of color, 838–843
flaw of racism ignored, 836–838
mediating processes between vulnerability and coping outcomes, 841–843
need for inclusive approaches to human development, 839–841

synthesized recursive framework, 844–853
bidirectional influences of significant others on youths' development, 844
foundational role of social cognition and linkages to phenomenology, 844–847
inference-making perceptions, 844–847
phenomenology and context character, 846–847
self processes of diverse youth, 845–846
social cognition and development, 845
youth's everyday experiences, 844–847
systems framework in ecological system, 847–853
emergent identities, 848, 850
life-stage-specific coping outcomes, 848, 850
net stress, 848
net vulnerability, 847, 848
reactive coping methods, 848, 850
unique experience of African American male adolescents, 857–859
Phenomenology (Hegel), 62
Phylogenesis, 19
Physical development, positive youth development and, 909
Physical environment, 814–815
"Pile-up" hypothesis, positive youth development, 921–923
Plasticity:
age-associated changes in, 584–586
developmental; weak and strong constraints, 529–530
malleability in intellectual functioning across historical and ontogenetic time, 611–612
relative, 3, 904
and temporality in human development, 3
Play:
cultural differences, 760
syntelic character of, 507–509
Playfulness/discipline (polar dimensions of complexity), 487–488
Pluralistic universe, 58
versus dualism, 58
versus monism, 58
Points of view, 36
Polarities, complexity and, 482, 484–489
agency and communion, 485
divergent and convergent thinking, 486–487
energy and quietude, 488–489
extroversion and introversion, 488
iconoclastic and traditional, 489
passive investment and detached objectivity, 486
playfulness and discipline, 487–488
Positive human development perspective, features/implications of, 11–12
Positive youth development, 894–933
age, 928–929
boundaries/expectations, 907
commitment to learning, 907
core constructs, 897
defining, 895–898
developmental assets, framework of, 907–908
empowerment, 907
gender, 928
historical and social context, 898–901
intellectual development, 909
overview/introduction, 894–895, 932–933
personal/social assets, 909
physical development, 909
positive developmental settings, features of, 912
positive identity, 908
positive values, 907
protective factors, 906
psychological/emotional development, 909
race/ethnicity and SES, 929–930
research, 928–930
research support for key hypotheses, 914–928
community hypothesis, 926–928
contextual change hypothesis, 916–917
covariation hypothesis, 920–921
how much explanatory power is reasonable to expect, 915
longitudinal hypothesis, 923–925
overview, 915
"pile-up" hypothesis, 921–923
universality/diversity hypothesis, 928
youth action hypothesis, 917–920
social competencies, 907–908
social development, 909
support, 907
theory, 901–914
conceptual models of positive development, 905–910
context and community change, 913–914
context and community influence, 910–913
human development, 902–905
Positivism/neopositivism, 71, 73–74
Post-modern path, and religious/spiritual development, 944–946
Poverty:
duration of exposure to, 682–683
gender, 690

Pragmatic feedback cycle, 191
Pragmatics. *See* Intellectual functioning across life span; Personality development across the life span
Pragmatism, 68–70
Prayer, 955, 973–975. *See also* Religious and spiritual development
Precocity, argument from, 344–345
Primacy of social forces, 31
Primary/secondary process thinking, 478
Principle of parsimony, 179–185
Probabilistic epigenesis, 219–220, 248
Probabilistic states, Ford and Lerner's model of developmental change as a series of, 270
Problem-finding mode, 479
Process(es):
  bioecological model, 795
  cultural psychology, 728
Processing speed, 600
Process-person-context model, 866
Process-Person-Context Time (PPCT) model, 798
Progressing equilibration, 196
Protective factors, positive youth development, 906
Proximal dynamic person-environment systems, 425
Proximal processes, 363, 795, 866
  focus of attention in, 813–814
  in solo activities with objects and symbols, 814
Psychoanalysis/Freud, 114–117, 144–145, 948–949
Psychological space landscapes, 268
Psychological structure:
  dynamic nature of, 317–318
  as dynamic skill, 321–325
    common ruler for skill development, 322–325
    context specificity and culture, 322
    generalization through construction, 325
    integration and interparticipation, 321–322
    self-organization, mutual regulation and growth, 322
Psychological synthesis, 181
Psychological tension, 188–189
Psychopathology. *See* Pathology
Public/Private Ventures (P/PV), 927
PVEST. *See* Phenomenological variant of ecological systems theory (PVEST)

Qualitative change, 26
Quantification in context, 172
Quantitative trait locus (QTL), 224–225
Quietude/energy (polar dimensions of complexity), 488–489

Race development, 108
Race/ethnicity, positive youth development and, 929–930
Race theory, critical (CRT), 830, 875–878
Racism, 836–838, 883–885
Random selection, 42
Reach, learning to; dynamic systems approach to, 292–297, 298
  average speed of reaching, 295
  changes in straightness/smoothness of reach trajectories of four infants, 294
  collective variable dynamics, 293
  first transition, 293–297
  model of levels of control, 298
  shifts in control during first year, 296–297
Reading:
  developmental pathways of good and poor readers, 335
  task profiles for normative developmental sequence for reading words, 351
Real, the (capital R), 54–55
Reciprocal continuity, 683
Reciprocity and interdependence, holistic-interactionist model, 434–435
Reduction description, 71–72
Reductionism, 7–10, 56–57
Reflective judgment, development of, 386
Reflective level of analysis, 21
Regulation, adaptive developmental, 905. *See also* Self-regulation
Relational approach to inquiry (diagram), 49
Relational/contextual model of development (Reich), 965
Relational developmental tradition, Plato and Aristotle and, 55–56
Relational metatheory, 3, 5–6, 19, 32–39
  holism, 32–33
  identity of opposites, 33–36
  implications for developmental science, 5–6
  opposites of identity, 36–37
  synthesis of wholes, 37–39
Relational scientific methodology, 74–80
  abduction-transcendental argument, 77–80
  causality and action patterns, 76–77
  interpretation and observation, 75–76

Relational standpoints in psychological inquiry (person/biology/culture), 37
Relationship view of life patterns, 673
Religious and spiritual development, 942–991
  attachment, 979–980
  conceptual development in, 972–976
  congregations, 981–982
  in context, 976–982
  as coping (psychoanalytic theory), 948–951
    Erikson, 949–950
    Freud, 948–949
    Jung, 949
    object relations theorists, 950–951
  definitions, 952–957
    content, form, and function, 954–956
    religion, religiousness, and spirituality, 953–954
    stage and structure, 956–957
  developmental approach, 943–944
  family context, 977–980
  historical perspective on, 946–952
  as maturing, 947–948
  negative correlates and pathology, 985–990
    cult and occultist practices, 987–988
    mental disorders, 989
    pathogenic/toxic beliefs/practices/attitudes, 989–990
    terrorist groups, 988–989
  overview/introduction, 942–943
  as perfecting, 951–952
  positive correlates of, 982–985
    advanced age and, 985
    coping, 984
    health and well-being, 982–983
    moral development, 983–984
    moral judgment, 983–984
    service, 984
  post-modern path and, 944–946
  prayer, personal, 955
  religious schools/education, 980–981
  socialization and practice, 977–979
  stage-structural theories, 957–967
    cognitive-stage theories (Goldman), 958–959
    concerns/attacks on, 965–967
    faith developmental theory (Fowler), 959–961
    Fowler and Oser and Gmünder's theories compared, 964–965
    relational and contextual model of development (Reich), 965
    stages of Piaget and Goldman compared, 958
    stages of religious judgment and reasoning (Oser and Gmünder), 961–965
  stage-structural theories, alternatives to, 967–972
    cognitive-cultural theories, 970–971
    developmental systems theories, 971–972
    spiritual child movement, 968–970
    substantive-functional approach (Kwilecki), 967–968
  studies:
    cognitive-cultural approach, 975–976
    conceptions of religious institutions, prayer, and death, 973–975
    stage-structural approach, 972–975
    supernatural agencies, 972–973
    synthesis, 976
Reserve capacities of self and personality development, 637–641
  baseline/developmental, 585
  evidence in indicators of personality structure, 638
  evidence in self-regulatory processes, 641
Resilience, growth versus, 578–579
Resource allocation, life span changes in, 578–580
Resource characteristics of the person as shapers of development, 812
Retroduction, 64
Robot, Lego (microdevelopment of understanding), 366
Robotics, epigenetic, 288
Rulers/clocks, 350–352

Sampling, historically structured, 184–185
Scaffolding, 330
Scalloping, 366, 367
Schools. *See* Education
Science, basics of, 170–177
  conventionalism, 71
  data collection, 172–173
  hypotheses testing, theory-driven versus pseudo-empirical, 173
  instrumentalism, 71
  intellectual interdependency of social sciences: episodic growth spurts, 170–171
  international nature of contemporary psychology, 171
  methodologies, 71
  organizing knowledge construction; frames of reference, 173–175
  pathways to objectivity, 171–173

Science, basics of *(Continued)*
positivism, 71
quantification in context, 172
social interdependency of psychology, 170–171
split tradition versus relational tradition, 71
statistics as a form of inductive logic, 172–173
Scientific nature of developmental inquiry, 64
Scripts:
cultural, 550–551
customary scripts for interaction, 739
emotions and dynamic organization of activity and development, 377
shame, adult, 372
Search Institute, 927
Selection:
development as, 284–286
and endogeniety, and contextual effects, 687–689
Selective optimization with compensation (SOC) model, 591–595
age gradients, 594
compensation, 593–594
definitions, 591–593
dual-task research and behavioral indicators, 595
empirical evidence on SOC theory, 594–595
examples from proverbs and questionnaire items, 592
management and mastery of life tasks, 595
optimization, 593
selection, elective and loss-based, 593
Selective responsiveness, 810–811
Self:
conceptual, 549–550, 751–752
coordination of the self and the other (Mead), 190–193
cultural, 752
dialogical models of, 201
future selves, life plans, and cultural scripts, 550–551
as historical product, 763–764
interaction with others, and, 762–763
ontogeny of conceptual self and of internalized control, 549–550
as unreal, 750
Self-actualization (Maslow), 467, 476
Self-concept development, 634
Self-consciousness, 411–412
Self-correcting teaching style, 490
Self-development:
action theory, and intentional, 535–544
attentional focus, 537–538
complexity and differentiation, 537
goals, 540–544
processes of self-evaluation, 538–540
protective and defensive mechanisms, 538
self-observation and self-monitoring, 536–538
structure and process, 535–536
cultural psychology of, 749–754
sociocultural participation and, 763
Self-efficacy concept, 481
Self-evaluations, 411–412
action theory and, 538–540
adaptive value of, 639
goal of, 638–641
lifetime comparisons, 640–641
social comparisons, 640
Self-functioning, 749
Self-in-Relationships (SiR) Interview, 331, 354
diagram constructed by 15-year-old Korean girl, 355
Self-organization, 19
Self-perceptions, 411–412, 452
Self practices, 729
Self processes of diverse youth (PVEST), 845–846
Self-regulation:
capacity for; complex person, 481
of context engagement, 904
of experience, 471–472
processes for, 619, 634–636
Self-system approach, personality development, 619–620
Selfways (ways of being), cultural diversity in,754–764
self as historical product, 763–764
self develops through sociocultural participation, 763
self is constituted in interaction with others, 762–763
in some East Asian cultural contexts, 758–761
in some European American contexts, 755–758
in some other cultural contexts, 761–764
Sensitive periods, learning experiences and, 430
Sensorimotor bases of higher cognition, 306
Sensory stimulation, influences on on genetic activity, 217
Service, religious/spiritual development and, 984
Shame:
hierarchy of categories, in Chinese, 375
prototypical script for adult, 372
Significant others, bidirectional influences of, on youths' development (phenomenological variant of ecological systems theory), 844
Situational imperatives, 690, 691

Skill(s):
A-not-B task, 287, 299–303
challenge and, 483
defining, 298–307
dynamic, 321, 329–336
growth curves, 365–367
optimal experience of flow and, 477–478
scale, 323, 324–325
Skin color, 867
Sleeping arrangements, family, 725–727
Social address model, 866
Social applications:
contemporary advances, 155–156
historical theme, 123–124
Social cognition, phenomenological variant of ecological systems theory, 844–847
Social competencies (positive youth development), 907–908
Social constructivism, 65, 522
Social determinism, 43
Social development:
divergent interpersonal worlds of childhood, 733–734
historical perspectives, 135–136
positive youth development and, 909
Social dissonance, 839
Social forces, primacy of, 31
Social integration, neighborhoods, 818
Social interaction (dynamic systems), 305
Social interdependency of psychology, 170–171
Social learning, 148–151
Social neobehaviorism, 143–144
Social organization:
of childhood experience, 734–738
age-graded activities, 738
care-giving relationships, 736–737
organizational settings, 734–736
parental practices, 737–738
domestic groups:
boundedness of, 736
composition of, 735
function of domestic groups, 734–735
size of, 735
social density of, 735
roles, cycles, and age (life course development), 672–673
Social pathways, and individual life course, 680–684
Social relations, cultural mentalities concerning childhood, 738–739
Social science assumptions/practices, judicial decisions, 868–878
Social stigma, 832
Societal/economic conditions, 428
Societal regulations, formal/informal, 428
Sociocultural embodiment, 49
Sociocultural patterns in human experience, 674–675
Sociocultural variation and frames of meaning, 356
Socioeconomic status (SES):
positive youth development and, 929–930
reading ability and, 681
Sociogenesis, 110–111
Soft assemblies (dynamic systems), 274–275
Spirituality. *See* Religious and spiritual development
Split mechanical explanation, 70–75
Split metatheory, 19, 30–32
Split neo-Darwinian metatheory:
developmental applications, 43–46
diagram, 42
flawed story of change, 46–47
Split versus relational tradition, 71
Splitting:
emotional, 379–382
foundationalism and, 31, 56, 57
Stage theory:
cognitive development, 341–342, 343
religious/spiritual development, 956–957 (*see also* Religious and spiritual development, stage-structural theories)
Standpoints, 36, 38
Statistical models, methodological note, 802
Statistics as form of inductive logic, 172–173
Strategies of coordination, 685
Strategy choice as mechanism of development, 45
Stress. *See* Phenomenological variant of ecological systems theory (PVEST)
Structural theories of action, 521–522
Structural transposition, 186
Structure:
defined, 315, 956–957
form and, 315, 340–341
religious/spiritual (*See* Religious and spiritual development, stage-structural theories)
Structure breaking and problem finding, 482–483
Structuring role of external information, dynamic systems, 305
Subconscious processes, 410
Substantive-functional approach (Kwilecki), 967–968
Supernatural agencies, 972–973

Synaptogenesis as mechanism of development, 45
Synchronic perspective, 405
Synchronization, 429–430, 685
Synchrony, developmental, 331–333
Synergetics, 271
Synthesis:
  holistic-interactionist model, 439
  nativism/empiricism, 338–340
  neo-Darwinian/modern, 41–42
  of wholes, 19, 37–39
System(s):
  defined, 19
  dynamic (*See* Dynamic systems theory)
  versus mechanico-reductive and vitalistic-constructive viewpoints, 214–217
  theory as metaphor, 268–271

Teacher-child interaction and growth of complexity, 501–506. *See also* Education
Teleology, subjective/objective, 26
Temperament, 376–378
Temporality. *See* Time
Tension, 188–189
Terrorist groups, 988–989
Theoretical level of discourse, 21
Theory of mind, 731–732
Theory of neuronal group selection (TNGS), 285
Thinking, divergent/convergent (polar dimensions of complexity), 486–487
Thoughts and actions. *See also* Dynamic development of action and thought:
  cognitive development and cultural psychology, 764–768
  contemporary advances, 154
  historical theme, 121–122
Time:
  clocks/rulers, 350–352
  in bioecological model: micro-, meso-, and macrochronological systems, 820–822
  nested timescales, dynamic systems, 277–289
  periods, proximal processes, 795
  temporality:
    age and, 669
    holistic-interactionist model, 436–437
    and plasticity in human development, 3
Timing, principle of; life course development,694–695
Topological psychology (Lewin), 194
Traditional/iconoclastic (polar dimensions of complexity), 489
Trait personality, 618, 631–633
Trajectory(ies), 195–196, 289–290, 589, 684–687
Transformational versus variational change, 23, 25–28, 42
Transition(s):
  dynamic systems, 275–276, 290
  identifying points of, 290
  life course development, 684–687, 689–701
  mechanisms, microdevelopment, and new knowledge, 363–370
  shift of focus, 365
Transitive/intransitive relations, 182–183
Turning points, 684–687
Typists, speed and knowledge in aging, 610–611

Unemployment, 682, 684
Unified concept of development, 28–30
Unit(s) of analysis:
  centrality of transfer and, 186
  holistic look at, 186
  problem (cultural psychology), 724–730
  synthetic, 186
United States, new psychology in, 104–107
Universality/diversity hypothesis, positive youth development, 928
Universality/invariance in development; action-theoretical account of, 530–535
  conceptual implications, 533–535
  constructive and conventional implications, 533
  developmental universals as empirical regularities, 530–531
  developmental universals as structural implications, 531–532
  formal implications, 532–533
Unwed motherhood, life course of, 686

Values:
  cultural psychology, 769–770
  positive youth development, 907
  valuations, and norms (person-environment), 410–411
Variability:
  dynamic skills and, 329–336
  explaining versus "explaining away," 342–346
  inter-systemic, 184
  intra-systemic, 184
  as phenomenon not "error," 183–185
Variable approach to inquiry (diagram), 50
Variable/person-centered standpoints, 49–50

Variational versus transformational change, 23, 25–28, 42
Vietnam War resisters, 693
Vitalistic-constructive viewpoints; systems versus mechanico-reductive and, 214–217
Vulnerability, mediating processes between coping outcomes and, 841–843. *See also* Phenomenological variant of ecological systems theory (PVEST)

Webs, constructive, 319–320, 325–329
Wechsler Intelligence Scale for Children-Revised (WISC-R), 213, 214
Well-being, biology and, 415–416
"Whole" issue of development, 186
Williams syndrome, 214
Wisdom:
  complexity and, 491–493
  as expertise in fundamental pragmatics of life, 606–608
Working memory, 601
Working model, 500
Worldviews, 19, 21, 452

Youth action hypothesis, 917–920
Youth development. *See* Positive youth development

Zone of proximal development (ZPD), 192–193, 498